REPORT RESUMES

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A COMPARATIVE STUDY OF PROGRAMMED AND TRADITIONAL TECHNIQUES FOR TEACHING MUSIC READING IN THE UPPER ELEMENTARY SCHOOLS, UTILIZING A KEYBOARD APPROACH. FINAL REPORT.

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THE PURPOSE OF THIS STUDY WAS TO INITIATE A PROGRAM FOR TEACHING MUSIC READING SKILLS, USING THE PIANO KEYBOARD IN COMBINATION WITH PROGRAMED LEARNING, AND TO COMPARE IT WITH CONVENTIONAL METHODS OF MUSIC INSTRUCTION. FOURTH, FIFTH, AND SIXTH GRADERS AT ONE CLEVELAND PUBLIC SCHOOL COMPRISED THE CONTROL GROUP RECEIVING CONVENTIONAL MUSIC READING INSTRUCTION. THE SAME GRADES AT ANOTHER CLEVELAND SCHOOL WERE THE EXPERIMENTAL GROUP FOLLOWING THE LEARNING PROCEDURES DEVELOPED BY THE AUTHOR. THE EXPERIMENT WAS PERFORMED OVER 2 SEMESTERS, THE SECOND SEMESTER REPEATING THE MATERIAL COVERED IN THE FIRST. ALL GROUPS WERE TESTED IN 5 AREAS OF MUSIC KNOWLEDGE. THEY TOOK A PRETEST BEFORE THE FIRST SEMESTER, A POSTTEST BEFORE THE SECOND SEMESTER, AND A TERMINAL TEST AFTER THE SECOND SEMESTER. THE MANN-WHITNEY "U" TEST WAS USED TO ANALYZE DATA OBTAINED. TEST RESULTS IN AREAS 1 AND 2, STAFF KNOWLEDGE AND KNOWLEDGE OF TONAL ORGANIZATION, WERE SIGNIFICANTLY HIGHER FOR EXPERIMENTAL STUDENTS THAN FOR CONTROL STUDENTS. RESULTS IN THE OTHER 3 AREAS REVEALED THAT TYPICAL METHODS ARE NOT SUCCESSFUL AND THAT THE AUTHOR'S METHOD HAS POTENTIAL, THOUGH IT NEEDS TO BE FURTHER DEVELOPED. THE RELIABILITY OF THE TESTS WAS DETERMINED BY KUDER-RICHARDSON RELIABILITY COEFFICIENTS AND SPEARMAN RANK CORRELATION COEFFICIENTS. (MS)

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## Utilizing a Keyboard Approach

January 1967

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

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FINAL REPORT APPROVED AND ACCEPTED

Kathryn Bloom
Director
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Date: 3/9/67

2/2/67

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Western Reserve University

Cleveland, Ohio

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H 2 . Paper keyboard with numbered keys (Panel I) . . . H - 3

H 3 . Chromatic Signs (Panel II) . . . . . . . . . . . H - 18

H 4 . Finger pattern for any major scale (Panel III). . H - 37

H 5 . Finger patterns for any major or minor triad (Panel IV) . . . . . . . . . . . . . . . . . . H - 46

I 1 . The grand staff—a graph of the keyboard . . . . I - 2

I 2 . Form A, written classwork in Area 1 (Staff Knowledge) . . . . . . . . . . . . . . . . . . . I - 5

I 3 . Form A, written classwork in Area 1 (Staff Knowledge) completed correctly . . . . . . . . . I - 6

I 4 . Form B, written classwork in Area 1 (Staff Knowledge . . . . . . . . . . . . . . . . . . . . I - 8

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# I. INTRODUCTION

## A. The Problem

Music educators in the upper elementary schools are responsible for the musical training of all fourth, fifth, and sixth grade pupils. Comparatively few of these pupils will become professional musicians. Of the vast majority, some will become amateur musicians, but most will become the listening audience.

The quality of this audience, and therefore the level of culture of each individual therein, is almost entirely dependent upon the development of sophisticated responses to music. One way to enhance the development of music appreciation is through a working knowledge of musical notation.

Therefore, music educators must be concerned with instruction in musical notation for all children. If they are to develop a nation of musically literate adults, music educators must also be responsible for effectively teaching music reading skills to all pupils in the upper elementary schools.

In the upper elementary school there are three factors which are not conducive to the development of a satisfactory music reading program: (1) upper elementary pupils do not have a common background of music reading experiences, (2) upper elementary pupils do not receive common music reading experience, (3) upper elementary pupils do not learn to read music independently, because of their reliance on the relatively few pupils who are able to read.

The three factors listed above are typical of elementary schools throughout the country. They can be illuminated in detail by an examination of the Cleveland Public Schools, which typify the music reading problem in public schools throughout the United States. The following description of the practices in the Cleveland Public Schools (as of September 1964) will be recognized by the informed reader as being rather typical of the problem nationwide (the numbered paragraphs refer back to the enumerations of the preceding paragraph):

1. Although upper elementary pupils who begin and remain in the Cleveland Public Schools from kindergarten through third grade have a four-year background program of singing, listening, performing, creating, and "reading readiness" experiences, the learning of musical notation of pitch on the staff is not stressed until the fourth grade. Moreover, this four-year background varies greatly since the pupil population is largely transient (intra-school system as well as inter-school system). Furthermore, many of the first grade through third grade music classes are taught by the classroom teacher, rather than by a music specialist. The classroom teachers range from those with little or no interest or ability in music to those who are keenly interested with considerable musical competence. The music specialist, on the other hand, is a musically trained educator.

2. The Music Division of the Cleveland Public Schools leaves to the discretion of the individual teacher the system to be employed in teaching music reading: either scale numbers, solfege syllables, or letter names; or any combination of these. No standards of music reading skill have been set. A series of radio music lessons (which are not mandatory) and their accompanying guides serve as a skeletal course of study and indicate suggested activities for singing, listening, performing, and creating, but rarely for development of music reading skills. No program of testing is employed to evaluate music reading skill. At no time, even by the end of the last semester of the sixth grade, has the individual pupil been tested to evaluate his music reading experiences. Although the majority of general music teachers in the upper elementary school are music specialists, the remainder are classroom teachers whose musical interests and abilities vary greatly.

3. It has been mentioned that no program of testing is employed to evaluate music reading skill; however, music teachers and their supervisors do evaluate aurally the ability of the class in reading music, the frequency of such evaluation varying with each music teacher and supervisor. Empirically speaking, one would find that most upper elementary music classes sight-read music only with difficulty, and that the individual pupils who make up these classes are, for the most part, incompetent music readers. It is stated, "for the most part", since the notation is accurately reproduced in sound by a few (most often those with a background of instrumental music instruction), and the remainder of the class, almost simultaneously, matches their sound. Instrumental instruction, on rare occasion, is received outside the school. For the most part, Cleveland Public School upper elementary pupils who play instruments receive their

instruction in school. The school makes instruction available on a selective basis to those who score high both in a Seashore Measures of Musical Talent abridgement and in certain intelligence measures. Those pupils selected are taught by special instrumental music teachers during school time, sometimes in addition to, and sometimes in place of the general music class.

In searching for a solution to the above three factors which are not conducive to the development of a satisfactory music reading program, the author evolved a plan of action which had at its core a revision of the method of teaching music staff reading:

The G, or treble, clef is traditionally taught first (usually by means of unrelated mnemonic devices) since it has immediate use for the treble-voiced child and since learning more than one clef is generally believed to be "too complicated".

However, by teaching the entire grand staff at the outset, the necessity of inferring to the pupil that the F clef or even the C clef (which relates easily to the grand staff) is "more difficult to read" is obviated. Furthermore, it is necessary for vocalists to read different clefs in junior high school according to their voice classification; for instrumentalists to read different clefs which they will require according to the instrument being played; for vocal and instrumental soloists to be able to gain an understanding of the harmony of accompaniments— an understanding so necessary to musical performance; and for all pupils to have a visual presentation of the concepts of various octaves and ranges commonly used for voice and instruments. All of these requirements are met by teaching the grand staff as the basis of music reading.

The grand staff, in turn, may well be presented (without recourse to mnemonic devices) by utilizing the keyboard as an audio-visual-kinesthetic aid, since it encompasses the range implied by the grand staff (with its extensions) and since the lines of the grand staff can be equated with alternate white keys of the keyboard.

The keyboard is also a logical choice for introducing major scales and their key signatures, since a tetrachord finger pattern for each hand (excluding the thumbs) can be employed to quickly locate the correct tones for any major scale (such a single pattern is not available for string or wind instruments), and since the various patterns of black and white keys thus located readily suggest the key signature of each major key. Moreover, the keyboard is a most practical medium for presenting some fundamental concepts of tonal organization such as, whole steps, half steps, major triads, and minor triads.

## B. Review of Literature

In the summer of 1963 the author made a survey of literature pertinent to the problem being studied. This survey sought, in part, answers to the following questions: (1) Had the keyboard been used as a teaching machine in a music reading program for all pupils in the upper elementary schools? (2) Since programmed learning techniques had rapidly developed in recent years, what applications of them had been made to keyboard instruction?

The survey, updated through September 1965, revealed:

1. That the use of the keyboard in the upper elementary schools had been limited to:

    a) "Keyboard experience" classes, which enabled all pupils to use the keyboard only superficially in music reading experiences,

    b) "Piano classes", which were for selected pupils with the stress on performance rather than on musical understanding through reading skill.

2. That a classroom approach directed to all upper elementary pupils and focused on fostering music reading skills primarily through utilization of the keyboard was yet to be developed.

3. That there had been no attempt at combining the utilization of the keyboard as a teaching machine with programmed learning techniques in teaching music reading in the elementary schools.

## C. Purpose of the Study

The purpose of this study is to initiate a course of study utilizing the keyboard in combination with programmed learning, the first phase of a music reading program which would:

1. Allow pupils entering from without the school system or transferring from another school within the school system to acquire basic music reading skills regardless of prior training,

2. Allow classroom teachers with little or no interest or ability in music to become interested and able as they learned

with the class in programmed learning.

3. Allow all pupils to use a uniform system (letter-names) in music staff reading,

4. Allow all pupils to follow a continuous course of study for developing the ability to read music independently,

5. Allow all pupils to have their acquisition of these basic skills evaluated.

## D. Objective of the Study

The objective of this study is to test the effectiveness of a particular combination of keyboard activities and programmed learning materials in teaching basic skills in music reading, as compared with typical music reading activities in the Cleveland Public Schools.

## E. Hypothesis of the Study

The hypothesis of this study is that upper elementary pupils will more effectively acquire some basic skills for reading music when trained utilizing the combination of keyboard and programmed learning methods than by typical methods for teaching music reading skills.

## II. METHOD

### A. Experimental Design

Fourth, fifth, and sixth grade pupils at one Cleveland public school are designated "Control Group". These pupils are instructed by the author for one school year (two semesters), with the exception of one class, designated "Control$^2$ Group", which is instructed by a classroom teacher (qualified to teach music) during the second semester.

Fourth, fifth, and sixth grade pupils at another Cleveland public school are designated "Experimental Group". These pupils are instructed by the author, with the exception of two groups instructed by classroom teachers (qualified to teach music): one, designated "Control$^1$ Group", instructed during the first semester, and not included in the study the second semester; the other, designated "Control$^3$ Group", instructed during the second semester, having been an "Experimental Group" during the first semester.

All Control Groups follow those procedures prescribed, suggested, and approved for general use in Cleveland upper elementary school vocal music (actually, general music) classes.

All Experimental Groups follow those procedures developed by the author, based on the use of the keyboard, programmed learning, and supporting techniques in acquiring some basic skills for reading music.

All groups are tested at the beginning of the first semester (Pre Test); again, before the second semester's work begins (Post Test); and, finally (with the exception of 6A pupils promoted to junior high school), at the end of the second semester (Terminal Test).

Pre Tests, Post Tests, and Terminal Tests are given in each of the following areas (the Appendix references may be consulted for details concerning the original test instruments employed):

Area 1. Staff Knowledge (see Appendix A),
Area 2. Knowledge of Fundamental Concepts of Tonal Organization (see Appendix B),
Area 3. Rhythmic Discrimination (see Appendix C),
Area 4. Interval Recognition (see Appendix D),
Area 5. Discrimination of Pitch Errors and the Ability to Correct Them (see Appendix E).

The independent variable is a method combining keyboard, programmed learning, and other special techniques for teaching basic music reading skills in upper elementary schools.

The dependent variable is the score comparison of the Pre Tests with the Post Tests, the Post Tests with the Terminal Tests, and the change scores (Pre Test to Post Test and Post Test to Terminal Test).

The rationale for the selection of these variables is readily apparent through a study of the reasons why this design is appropriate for achieving the stated objective:

1. The Pre Tests of the Experimental and Control Groups may be used to statistically test the initial absence of difference between the groups;

2. The scores of Pre, Post, and Terminal Tests may be used to calculate change scores, which tend to emphasize individual rather than group results.

3. The first semester of study allows for an exploration of the effects of:

a) the experimental method versus the control method;

b) the control method as taught by the author (Control Group) versus the control method as taught by another teacher (Control$^1$ Group) to show whether or not the author's instruction was biased.

4. The second semester of study allows for an exploration of the effects of:

a) spiral learning (much of the instruction is repeated the second semester to accomodate pupils new to the school);

b) initial training in the areas of Rhythmic Discrimination and Interval Recognition;

c) retention in learning (one group—Control$^3$ Group—taught by the experimenter during the first semester is taught the second semester by a classroom teacher qualified to teach music);

d) bias or no bias (the control method as taught by the author—Control Group—versus the control method as taught by a classroom teacher qualified to teach music—Control$^2$ Group).

For more details of the experimental design see Appendix F.

5. The experimental method of instruction is taught to all Experimental Groups by the same teacher, thus assuring more control of the experimental variables than if more than one teacher were employed.

## B. Population and Sample

The population consists of all fourth, fifth, and sixth grade public school pupils throughout the United States. The sample is a judgment sample of all fourth, fifth, and sixth grade pupils at two Cleveland public schools. Substantiation for inferences made from this sample to the population is based on representativeness demonstrated by these schools in nationally standardized tests (4,5). The judgment sample eliminates certain cases of pupils who fall into certain categories (nothing is known to the author of the musical ability of such eliminated cases that would bias the results) as follows:

1. Absentees and transfer pupils who do not receive Pre and Post Tests in at least one area.

2. Pupils who receive no tests.

3. Pupils who are absent more than five class periods during the first semester.

4. Pupils who do not complete the written classwork in Area 2 or in both Areas 1 and 2 during the first semester. Pupils who complete the written classwork in Area 2 but not in Area 1 are eliminated from statistical treatment in Area 1 only.

For details of the actual sample selection, see Appendix G.

## C. Control Procedure

All control groups meet two forty-minute periods per week, eighteen weeks per semester, two semesters during the school year. Building organization and the music testing program account for five weeks of the second semester, leaving an actual training period of thirteen weeks (twenty-six periods).

The classroom activities are augmented by the following:

1. School assembly programs involving vocal and instrumental music pupils' participation,

2. Preparation of each class for a Severance Hall (Cleveland Orchestra) concert program (including guided listening and recognition of instruments by sight and sound),

3. Class lessons in instrumental music as well as a school orchestra are activities limited to the few pupils selected for such activity by the instrumental music teacher,

4. A fifth and sixth grade choir of selected voices meeting twice weekly during the second semester,

5. For fifth grade classes only, a "Composer's Day" project in which each class creates original written melodies.

Pamphlets for each of the three upper elementary grades, entitled "Instructions for Radio Music", issued by the Music Division of the Cleveland Public Schools ( 1,10,11 ) serve as a guide in outlining the course of study for the control group at each grade level. Since scheduling difficulties would prevent many classes from receiving the radio broadcasts, and since the fifth grade radio broadcasts would not begin until the second semester, the radio lessons are not broadcast to any of the classes involved in this study. Instead, the author and the three other teachers instructing control groups, familiar with the content and character of the radio broadcasts, modifying the content to suit the individual classes taught, and spacing the material over a period of two semesters rather than one semester. The pamphlets consist of outlines of weekly lessons, each of which states material needed, purpose of the lesson, directions for the teacher to follow during the broadcast, suggested follow-up, and song material to be used in the broadcast.

The singing activities consist of songs in unison and two-part harmony taught primarily by rote. Diction, dynamic shading, vocal style, and tone quality are continually stressed. Frequently, portions of a song are read by the class, but such readings involve locating and singing a repeated phrase, singing a melodic figure based on the root position of a tonic chord, singing an ascending or descending scale, or some similar isolated task. Scale numbers, rather than sol-fa syllables or letter names, are employed. On several occasions a simple stepwise melody is to be read at sight by the entire class, but this is truly a group activity; only a small minority of the class may read independently, while the remainder of the class simply follows the leaders with alacrity.

The listening activities almost always associate sound with music notation, and this aspect of the course of study for the control groups continually calls attention to large forms, phrase patterns, melodic patterns, rhythmic patterns, harmonic patterns, major versus minor tonality, etc.

The performing activities include the use of rhythm instruments in ensemble indicating accent, beat, melodic rhythm, and some rhythmic configurations especially indigenous to Latin American music. The autoharp is employed for tonic, dominant, and subdominant harmonies with individual class members reading chord symbols from their books. Resonator bells are used occasionally by the pupils for playing simple short melodic and harmonic patterns as suggested in the "Instruction for Radio Music" pamphlets.

The creative activities include choice of rhythmic instrumentation, question and answer phrases sung on a neutral syllable, and setting words to music.

The rhythmic activities include bodily movement for various note values (e.g., "walk" for a quarter note), chanting rhythm names (e.g., "step-wait" for a half note), clapping rhythms read while chanting rhythm names, playing rhythms with rhythm instruments, distinguishing between several notated rhythms, recognizing the dotted quarter and eighth note rhythm combination, recognizing meter by sight and sound, and recognizing syncopation in either of the two forms: (1) eighth note—quarter note—eighth note pattern, (2) eighth note—dotted quarter note pattern.

The music reading activities, in addition to those which overlap the activities mentioned above, include a game activity in which various music symbols are found in songs (flash cards and blackboard are used in connection with this activity), reference to the treble staff and its line and space names using the traditional mnemonic devices, noting direction of melodic line, naming keynotes as a result of instruction in sharp and flat key signature rules, reading rhythms using the rhythm names mentioned above, and recognizing the tonic triad in root position when isolated, or in melodic context.

It should be pointed out that the following music reading topics are first introduced in the fifth grade: (1) key signature rules, (2) interval of a third, (3) tonic chord notation, (4) 6/8 measure rhythmic notation, (5) dotted eighth note—sixteenth note rhythmic combination. The following music reading topics are first introduced in the sixth grade: (1) brace or bracket, (2) conducting patterns, (3) accidentals, (4) vocal chording of primary triad harmonies in notation, (5) parallel major and minor triads in root position, (6) syncopation, (7) triplets, (8) pentatonic scale, (9) sequence in melody.

It will be noted that singing, listening, performing, creative, rhythmic, and music reading activities continually overlap, providing a variety of classroom activity. The song material of each lesson is varied, and often correlated with certain holidays, seasons of the year, other subject areas, etc.

### D. Experimental Procedure

All experimental groups meet two forty-minute periods per week, eighteen weeks per semester, two semesters during the school year. Building organization and the music testing program account for seven weeks of the first semester, leaving an actual training period of eleven weeks (twenty-two periods). Extensive building and room reorganization, personal illness of the author, closing week, and the music testing program account for ten weeks of the second semester, leaving an actual training period of eight weeks (sixteen periods). The discrepancy of five weeks (ten periods) between the second semester training period of the experimental and control groups does not damage the design of the experiment irreparably; any experimental groups meeting during this period simply sing songs learned by rote from the same texts as those used by the various grade levels of the control groups. During this period of time no attempt is made to teach music reading to the experimental groups.

The classroom activities of both semesters are augmented by the following:

1. School assembly programs involving vocal music pupils' participation,

2. Preparation of each class for a Severance Hall (Cleveland Orchestra) concert program (including guided listening and recognition of instruments by sight and sound),

3. Class lessons in instrumental music are limited to

the few pupils selected for such activity by the instrumental music teacher.

Scheduling does not permit a choir to be formed. Nor is the "Composer's Day" creative project (described as a control group teaching procedure) undertaken. Radio lessons are not received by any of the experimental groups, nor do the "Instructions for Radio Music" (described under "Control Procedure") serve as a guide in outlining the course of study for the experimental groups.

Instead, the following course of study is pursued:

1. Area 2. Knowledge of Fundamental Concepts of Tonal Organization.

During the first semester pupils are taught the material contained in the thirty pages of programmed learning, "Exploring the Keyboard" (see Appendix H).

The first seven pages of this original material, along with its accompanying mask (see page H-2), Panel I (see page H-3), and Panel II (see page H-18), are distributed to each pupil.

The teacher reads each item aloud, inserting the word, "blank", for each of the blank lines of each frame. The pupils are asked to raise their hands if they think they know the correct response. The teacher calls on several pupils, and after the various responses are given, the teacher directs the pupils to move the mask down to reveal the correct answer and expose the next frame. The teacher and pupils discuss any questions that might have arisen from the preceding frame, and then proceed to the next frame.

The remaining twenty-three pages of programmed learning are not distributed to the pupils, but instead serve as a "script" for the teacher. The author feels that at this point in the programmed learning the keyboard becomes a teaching machine and the pupils' reading of the programmed learning sheets would only slow down the rate of learning since each pupil would have to refer to one or more of the following: (a) a page of programmed learning, (b) an illustrative panel, (c) the keyboard, (d) the pattern of his fingers. The teacher follows the procedure outlined in the preceding paragraph, reading the programmed learning sheets aloud to the pupils. Large wall charts of Panel III (see page H-30) and Panel IV (see page H-46) are displayed at the appropriate times.

It should thus be clear that the programmed learning material is not self-instructional; teacher-directed activities must accompany the programmed instruction as described above and in the "Annotations" facing various pages of the programmed learning sheets (see Appendix H).

During the second semester the material of the first semester is repeated, with the exception of the written work described in the "Annotations" following Frame 50 (see page H-24).

2. Area 1. Staff Knowledge.

During the first semester, having finished the work of Area 2, pupils are shown that the grand staff is but a graph of the keyboard (see Fig. I1, page I-2). This is accomplished by a procedure described in detail in Appendix I.

The training is characterized by written work at the blackboard and at the pupils' seats. The written work emphasizes the stepwise (line-space-line-space, etc.) attribute of the grand staff, the G and F clefs as identifiers of specific lines of the grand staff, and the leger lines as abbreviated grand staff lines.

During the second semester the material of the first semester is repeated.

3. Area 3. Rhythmic Discrimination.

During the first semester there is no specific training given in this area.

During the second semester pupils receive no, one-half, one, one-and-a-half, or two class periods of training in this area (the periods vary according to pupil attendance and the availability of additional time after work in Areas 1 and 2 is completed.)

The training is characterized by a ratio approach to rhythmic reading, in which pupils learn the relative value (rather than a fixed value) for sixteenth, eighth, quarter, half, and whole notes and apply this knowledge by assigning a value of one to the fastest note value in whatever passage is to be read.

This is only a peripheral area of the study with which this report is concerned.

4. Area 4. Interval Recognition.

During the first semester there is no specific training given in this area.

During the second semester pupils receive no, one, one-and-a-half, two, two-and-a-half, or three periods of training in this area (the periods vary according to pupil attendance and the availability of additional time after work in Areas 1, 2, and 3 is completed).

The training is characterized by aural discrimination of intervals, with diatonic intervals being aurally measured by the pupils' singing of the scale numbers of a major scale (based on the lower tone of the interval being measured), and chromatic intervals being aurally measured by their half step deviation up or down from the upper tone of the nearest diatonic interval. The singing of the scale numbers is done audibly, at first, and then silently by the pupils. The intervals were presented in the following sequence: unisons and octaves; seconds and sevenths; thirds and sixths; fourths and fifths.

This is only a peripheral area of the study with which this report is concerned.

5. Area 5. Discrimination of Pitch Errors and the Ability to Correct Them.

There is no specific training given in this area during the first or second semester.

This last area, as well as the preceding two areas, were included in the study to appraise the learning increment, if any, in the experimental or control groups (or both).

E. Method of Analysis

1. Null Hypothesis. $H_0$: There is no significant difference in test results between the following groups: (a) experimental and control, (b) male and female (c) control and control$^1$, (d) control and control$^2$, (e) experimental groups completing written classwork and experimental groups completing none or some of the written classwork, (f) trained and untrained experimental groups. Alternative Hypothesis. $H_1$: There is a significant difference in test results between the following groups: (a) experimental and control, (b) male and female, (c) control and control$^1$, (d) control and control$^2$, (e) experimental groups completing written classwork and experimental

groups completing none of some of the written classwork, (f) trained and untrained experimental groups.

2. Statistical Test. The Mann-Whitney $\underline{U}$ Test is appropriate for analyzing the data obtained, since the two components of each of the following constitute two independent groups: (a) experimental and control, (b) male and female, (c) control and control$^1$, (d) control and control$^2$, (e) experimental groups completing written classwork and experimental groups completing none or some of the written classwork, (f) trained and untrained experimental groups. Also, the tests in all five areas of the experiment constitute ordinal measures at best.

3. Significance Level. Let $\alpha = .05$; $n_1$ = the number of cases in the smaller of two groups being measured, $n_2$ = the number of cases in the larger. However, in the computer print-out and in the tables which accompany this report, the symbols "N1" and "N2" are used invariably to identify the groups as follows:

(a) In tests of experimental versus control groups, N1 always refers to the experimental group, N2 to the control group;

(b) In tests of male versus female groups, N1 always refers to the male group, N2 to the female group;

(c) In tests of control versus control$^1$ groups, N1 always refers to the control group, N2 to the control$^1$ group;

(d) In tests of control versus control$^2$ groups, N1 always refers to the control group, N2 to the control$^2$ group;

(e) In tests of experimental groups completing written classwork versus experimental groups completing none or some of the written classwork, N1 always refers to the experimental groups completing written classwork, N2 to the experimental groups completing none or some of the written classwork;

(f) In tests of trained versus untrained experimental groups, N1 always refers to the trained experimental group, N2 to the untrained experimental group.

4. Sampling Distribution. Use formulas (15) for finding $\underline{U}$ where $n_2 > 20$; and for finding $\underline{z}$ which includes a correction for ties.

The probability associated with the occurence under $H_0$ of values as extreme as an observed $\underline{z}$ may be determined by reference to a table of areas of a standard normal distribution.

5. Rejection Region. Since $H_1$ does not predict the direction of the difference, the region of rejection is two-tailed. The region of rejection consists of all values of $z$ which are so extreme in either direction that their associated probability under $H_0$ is equal to or less than $\frac{\alpha}{2} = .025$ for positive values of $z$, and equal to or less than $\frac{\alpha}{2} = .025$ for negative values of $z$.

6. Decision. If the absolute value of the $z$ value from the data is equal to or less than the absolute value of the critical value ($\alpha = 1.96$) of $z$, accept $H_0$. If the absolute value of the $z$ value from the data is greater than the absolute value of the critical value ($\alpha = 1.96$) of $z$, reject $H_0$ and accept $H_1$. If $H_1$ is accepted, N1 has the higher significance if the median for N1 $>$ the median for N2; N2 has the higher significance if the median for N2 $>$ the median for N1. If the medians for N1 and N2 are equal, then N1 has the higher significance if the mean of the scores (or the ranks) of N1 $>$ the mean of the scores (or the ranks of N2; N2 has the higher significance if the mean of the scores (or the ranks) of N2 $>$ the mean of the scores (or the ranks) of N1.

The above decision is at the .05 level of significance. However, in reporting his findings, the author will indicate the actual probability level associated with his findings as being $< .05$, $> .02$; $< .02$, $> .01$; $< .01$, $> .001$, etc. Where $z = 4.000$ or less, the level of confidence can be ascertained from a standard table of probabilities associated with values as extreme as observed values of $z$ in the normal distribution; where $z > 4.000$, the level of confidence is available from "Kelley Statistical Tables" by T. L. Kelley (12).

## III. RESULTS

### A. Area 1. Staff Knowledge.

1. Reliability. The Kuder-Richardson Reliability Coefficients for the Pre Test administered to experimental and control groups combined are as follows: Grade 4, .17; Grade 5, .71; Grade 6, .75; Grades 4, 5, and 6 combined, .66. (For a discussion of the reliability of this test, see page A-5; for more detailed results see Table I, page A-6.)

2. Experimental versus Control Groups.

In Grade 4, there is no significance difference in Pre Test results. However, there is a significant difference in all other test results; in each case the experimental group tests significantly higher: in Change Scores (Pre Test to Post Test) the level of significance is less than .01; in Post Tests less than .001; in Change Scores (Post Test to Terminal Test) less than .00001; in Terminal Tests less than .00000001.

In Grade 5, there is no significant difference in Pre Test results. However, there is a significant difference in all other test results; in each case the experimental group tests significantly higher: in Change Scores (Pre Test to Post Test) the level of significance is less than .0001; in Post Tests less than .001; in Change Scores (Post Test to Terminal Test) less than .01; in Terminal Tests less than .00001.

In Grade 6, there is a significant difference in all test results except in Change Scores (Post Test to Terminal Test) where there is no significant difference. In Pre Test results, the control group tests significantly higher, the level of significance being less than .01. However, in all other test results the experimental group tests significantly higher: in Change Scores (Pre Test to Terminal Test) the level of significance is less than .00000001; in Post and Terminal Tests the level of significance is less than .0001.

In Grades 4, 5, and 6 combined, there is no significant difference in Pre Test results. However, there is a significant difference in all other test results; in each case the experimental group tests significantly higher: in Change Scores (Pre Test to Post Test), Post Tests, and Terminal Tests the level of significance is less than .000000001; in Change Scores (Post Test to Terminal Test) less than .000001.

(For more detailed results of the Mann-Whitney U Tests see Table XIII, page J-1.)

3. Experimental Groups Competing Written Classwork versus Experimental Groups Completing None or some of the Written Classwork in Grade 4 During the Second Semester. There is a significant difference in the results of both tests; in each case, the experimental group completing written classwork is significantly higher: in Change Scores (Post Test to Terminal Test) the level of significance is less than .05; in Terminal Test, less than .001. (For more detailed results of the Mann-Whitney U Tests see Table XXVI, page J-25.)

4. Male versus Female Pupils in Grades 4, 5, and 6 Combined.

In the experimental groups, there is no significant difference in Change Scores (Post Test to Terminal Test) nor in Terminal Test results. However, there is a significant difference in all other test results: in the Pre Test, the female pupils test signficantly higher, the level of significance being less than .05; in the Change Scores (Pre Test to Post Test), the male pupils test significantly higher, the level of significance being less than .02; in the Post Test, the male pupils test significantly higher, the level of significance being less than .05.

In the control groups, there is no significant difference in any test results.

(For more detailed results of the Mann-Whitney U Tests, see Table XIV, page J-3.)

B. Area 2. Knowledge of Fundamental Concepts of Tonal Organization

1. Reliability. The Kuder-Richardson Reliability Coefficients for the Pre Test administered to experimental and control groups combined are as follows: Grade 4, .60; Grade 5, .67; Grade 6, .61; Grades 4, 5, and 6 combined, .64. (For a discussion of the reliability of this test, see page B-5; for more detailed results see Table III, page B-6.)

### 2. Experimental versus Control Groups.

In Grade 4, there is no significant difference in Pre Test results nor in Change Scores (Post Test to Terminal Test). However, there is a significant difference in all other test results; in each case the experimental group tests significantly higher: in Change Scores (Pre Test to Post Test) and Post Tests the level of significance is less than .000000001; in Terminal Tests less than .0000001.

In Grade 5, there is no significant difference in Pre Test results. However, there is a significant difference in all other test results; in each case the experimental group tests significantly higher: in Change Scores (Pre Test to Post Test), Post Tests, and Terminal Tests the level of significance is less than .000000001; in Change Scores (Post Test to Terminal Test) less than .0001.

In Grade 6, there is a significant difference in all test results; in each case the experimental group tests significantly higher: in Pre Tests the level of significance is less than .01; in Change Scores (Pre Test to Post Test), Post Tests, and Terminal Tests the level of significance is less than .000000001; in Change Scores (Post Test to Terminal Test) less than .00001.

In Grades 4, 5, and 6 combined, there is a significant difference in all test results; in each case the experimental group tests significantly higher: in Pre Tests the level of significance is less than .001; in Change Scores (Pre Test to Post Test), Post Tests, and Terminal Tests the level of significance is less than .000000001; in Change Scores (Post Test to Terminal Test) less than .00000001.

(For more detailed results of the Mann-Whitney U Tests see Table XV, page J-5.)

### 3. Male versus Female Pupils in Grades 4, 5, and 6 Combined.

In the control groups, there is no significant difference in any test results.

In the experimental groups, there is no significant difference in any test results, except the Change Scores (Post Test to Terminal Test); in this latter case there is a significant difference, and the female pupils test significantly higher, the level of significance being less than .01.

(For more detailed results of the Mann-Whitney U Tests see Table XVI, page J-7.)

C. Area 3. Rhythmic Discrimination

1. Reliability. The Spearman Rank Correlation Coefficients indicating an association between Pilot and Pre Tests administered are as follows: Grade 4, -.0428 (the level of significance is greater than .10); Grade 5, .3138 (the level of significance is less than .05); Grade 6, .2934 (the level of significance is less than .025); Grades 4, 5, and 6 combined (the level of significance is less than .0005). (For a discussion of the reliability of this test, see pages C-1 and C-2; for more detailed results see Table V, page C-3.)

2. Experimental versus Control Groups.

In Grade 4, there is no significant difference in any test results, except the Change Scores (Pre Test to Post Test); in this latter case there is a significant difference, and the experimental group tests significantly higher, the level of significance being less than .02.

In Grade 5, there is no significant difference in any of the test results.

In Grade 6, there is no significant difference in the Pre and Post Test results, nor in the Change Scores (Pre Test to Post Test). However, in the remaining tests, there is a significant difference; in each case the control group tests significantly higher: in Change Scores (Post Test to Terminal Test) the level of significance is less than .05; in Terminal Tests less than .02.

In Grades 4, 5, and 6 combined, there is no significant difference in any of the test results.

(For more detailed results of the Mann-Whitney U Tests see Table XVII, page J-9.)

3. Trained versus Untrained Experimental Groups in Grades 4 and 6 During the Second Semester.

In Grade 4, there is no significant difference in the results of either test.

In Grade 6, there is no significant difference in Change Scores (Post Test to Terminal Test). However, there is a significant difference in Terminal Test results, in which case the trained experimental group tests significantly higher, the level of significance being less than .01.

(For more detailed results of the Mann-Whitney U Tests see Table XXVII, page J-26.)

4. Male versus Female Pupils in Grades 4, 5, and 6 Combined.

In the experimental groups, there is no significant difference in any test results, except the Post Tests; in this latter case there is a significant difference, and the male pupils test significantly higher, the level of significance being less than .05.

In the control groups, there is no signficant difference in any test results, except the Change Scores (Post Test to Terminal Test); in this latter case there is a significant difference, and the female pupils test significantly higher, the level of significance being less than .02.

(For more detailed results of the Mann-Whitney U Tests see Table XVIII, page J-11.)

### D. Area 4. Interval Recognition

1. Reliability. The Spearman Rank Correlation Coefficients indicating an association between Pilot and Pre Tests administered are as follows: Grade 4, .1864 (the level of significance is greater than .10); Grade 5, .5624 (the level of significance is less than .0005); Grade 6, .6533 (the level of significance is less than .0005); Grades 4, 5, and 6 combined, .4536 (the level of significance is less than .0005). (For a discussion of the reliability of this test, see page D-1; for more detailed results see Table VII, page D-2.)

2. Experimental versus Control Groups.

In Grade 4, there is no significant difference in any of the test results.

In Grade 5, there is no significant difference in any of the test results.

In Grade 6, there is no significant difference in any test results, except the Post Tests; in this latter case there is a significant difference, and the experimental group tests significantly higher, the level of significance being less than .05.

In Grades 4, 5, and 6 combined, there is no significant difference in any test results, except the Pre and Post Tests; in both of these tests the experimental group tests significantly higher, the level of significance in each case being less than .05.

(For more detailed results of the Mann-Whitney U Tests see Table XIX, page J-13.)

3. Trained versus Untrained Experimental Groups in Grade 6 During the Second Semester. There is no significant difference in any of the test results. (For more detailed results of the Mann-Whitney U Tests see Table XXVIII, page J-27.)

4. Male versus Female Pupils in Grades 4, 5 and 6 Combined.

In the experimental groups, there is no significant difference in any test results, except the Pre Tests; in this latter case there is a significant difference, and the male pupils test significantly higher, the level of significance being less than .01.

In the control groups, there is no significant difference in any test results, except the Change Scores (Post Test to Terminal Test); in this latter case there is a significant difference, and the female pupils test significantly higher, the level of significance being less than .05.

(For more detailed results of the Mann-Whitney U Tests see Table XX, page J-15.)

## E. Area 5. Discrimination of Pitch Errors and the Ability to Correct Them

1. Reliability. The Spearman Rank Correlation Coefficients indicating an association between Pilot and Pre Tests administered are as follows: Grade 4, .0615 (the level of significance is greater than .10); Grade 5, .3459 (the level of significance is less than .01); Grade 6, .4957 (the level of significance is less than .0005); Grades 4, 5, and 6 combined, .3769 (the level of significance is less than .0005). (For a discussion of the reliability of this test, see pages E1 and E-2; for more detailed results see Table IX, page E-3.)

2. Experimental versus Control Groups.

In Grade 4, there is no significant difference in any of the test results.

In Grade 5, there is no significant difference in any of the test results.

In Grade 6, there is no significant difference in the Pre Tests, Change Ranks (Post Test to Terminal Test), nor in the Terminal Tests. However, in the remaining tests, there is a signficicant difference; in each case the experimental group tests significantly higher: in Change Ranks (Pre Test to Post Test) the level of significance is less than .01; in Post Tests less than .05.

In Grades 4, 5, and 6 combined, there is no significant difference in the Pre Tests, Change Ranks (Post Test to Terminal Test), nor in the Terminal Tests. However, in the remaining tests, there is a significant difference; in each case the experimental group tests significantly higher: in Change Ranks (Pre Test to Post Test) the level of significance is less than .01; in Post Tests less than .02.

(For more detailed results of the Mann-Whitney U Tests see Table XXI, page J-17.)

3. Male versus Female Pupils in Grades 4, 5, and 6 Combined.

In the experimental groups, there is no significant difference in the Change Ranks (Pre Test to Post Test), Change Ranks (Post Test to Terminal Test), nor in the Terminal Tests. However, in the remaining tests, there is a significant difference; in each case the male pupils test significantly higher: in both the Pre and Post Tests the level of significance is less than .05.

In the control groups, there is no significant difference in any of the test results.

(For more detailed results of the Mann-Whitney U Tests see Table XXII, page J-19.)

F. Tests for Bias

1. Control versus Control[1] Groups in Grade 5 During the First Semester. There is no significant difference in any of the test results. (For more detailed results of the Mann-Whitney U Tests see Table XXIII, page J-21 and Table XXIV, page J-22.)

2. Control versus Control[2] Groups in Grade 6 During the Second Semester. There is no significant difference in any test results, except in Area 2 (Knowledge of Fundamental Concepts of

Tonal Organization). In this latter area, there is a significant difference in both tests given; in each case, the control group tests significantly higher: in Change Scores (Post Test to Terminal Test) the level of significance is less than .05; in Terminal Tests less than .02.

(For more detailed results of the Mann-Whitney U Tests see Table XXV, page J-23.)

G. Tests for Retention

The retention study was made of a group of fourth grade pupils (Control$^3$) who are subjected to the experimental procedure during the first semester and to the control procedure during the second semester. The Change Scores (Post Test to Terminal Test) are analyzed in Area 1 (Staff Knowledge) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization) only, since there was no specific training given in the other three areas during the first semester that would require an analysis of retention.

1. Area 1. Staff Knowledge. There is no significant difference in the scores of the Post Tests and Terminal Tests of Control$^3$ Grade 4 pupils, the level of significance being .05.

2. Area 2. Knowledge of Fundamental Concepts of Tonal Organization. There is no significant difference in the scores of the Post Tests and Terminal Tests of Control$^3$ Grade 4 pupils, the level of significance being .05.

(For a discussion of the retention tests and more detailed results of the Wilcoxon matched-pairs signed-ranks tests see Appendix K.)

# IV. DISCUSSION

## A. Area 1. Staff Knowledge

1. Reliability. The reliability coefficients suggest that this test is sufficiently reliable for evaluating the level of group accomplishment in Grade 5 and Grade 6.

The reliability coefficient for Grade 4 is much below the suggested .50 value; this in turn lowered the reliability coefficient for Grades 4, 5, and 6 combined to slightly below the .50 value.

The extremely low ranges of scores for Grade 4 suggest that the guess factor is responsible for the low reliability coefficient for Grade 4. Although, in Grade 4, the reliability coefficient for the tests administered the control group is slightly higher than that for the tests administered the experimental group, it is important to notice that the Mann-Whitney U Tests of the Pre Tests (these latter tests were those on which the reliability test was based) show no significant difference in Grade 4 results for either experimental versus control groups or male versus female pupils. Increasing the number of items in the test would raise the reliability, but to raise it sufficiently to the suggested .50 value would make the test impractically long. It is the author's opinion that the low reliability for Grade 4 is justified in that it is the best measure available for the purposes of this experiment.

2. Experimental versus Control Groups. Since there was no significant difference in Pre Test results in either Grade 4, Grade 5, or Grades 4, 5, and 6 combined, the author assumes that the two groups in these grades were reasonably equated in this area.

In the Pre Tests of Grade 6, the control group tested significantly higher. This would seem to indicate that the control group began their training in the experiment with a significant advantage over the experimental group; yet, in all other test results the experimental group tested significantly higher. This, in turn, seems to indicate that the experimental method of teaching was capable of overcoming an initial disadvantage.

Since there was a significant difference in all other test results in this area in Grade 4, Grade 5, Grade 6, and Grades 4, 5, and 6 combined, and since in each case the experimental group tested significantly higher, the author deduces that there was a continual significant improvement of the learning increment of the experimental groups over and above that of the control groups throughout the experiment in this area of the study.

3. Experimental Groups Completing Written Classwork versus Experimental Groups Completing None or Some of the Written Classwork in Grade 4 during the Second Semester. In selecting the judgment sample, the author eliminated from the study at the outset those cases which had completed none or only some of the written classwork during the first semester, believing that the completion of the written classwork was an essential part of the experimental variable. The written work of the first semester was repeated the second semester. Inasmuch as the experimental groups completing written classwork during the second semester scored significantly higher than those who did not, the author feels somewhat justified in his belief that the written classwork was an essential part of the experimental variable. Since an analysis of variance of the test results in Grade 4 of the experimental groups completing written classwork, the experimental groups completing none or some of the written classwork, and the control groups was not made, the author will not attempt to speculate on how much higher the significance of the results of the experimental groups completing written classwork is.

4. Male versus Female Pupils in Grades 4, 5, and 6 Combined. In the control groups, the fact that there were no significant differences in any test results seems to indicate that male and female pupils were reasonably equated at the outset and remained equated despite the training they received in the control groups.

In the experimental groups, the fact that the female pupils tested significantly higher in the Pre Tests, but that the male pupils tested significantly higher in both Change Scores (Pre Test to Post Test) and Post Tests seems to indicate that although the female pupils began their training in the experiment with a significant advantage over the male pupils, the experimental method was capable of overcoming this initial advantage of the female pupils.

A possible explanation of this phenomenon might be that the male pupils relate more to a male teacher than to a female teacher, but the author rejects this explanation on the grounds that there was no significant difference in male and female pupil scores in the control groups which the author, a male, also taught. Instead of this explanation, the author suggests that the control method, characterized to a great degree by singing activities, does not appeal as much to boys of this age (who are often more self-conscious about singing activities, perhaps because they often associate the required "head voice" quality with femininity) as the experimental method, characterized by oral and written classwork rather than by singing activities.

5. Level of Significance. Had the level of high significance (.01) been chosen rather than the .05 level of significance for this area, (a) the results of the experimental versus control groups would remain the same insofar as test decision was concerned, (b) the experimental groups completing written classwork versus experimental groups completing none or some of the written classwork would remain the same insofar as test decision was concerned for Terminal Test, but the Change Scores (Post Test to Terminal Test) would show no significant difference, (c) the male pupils versus female pupils would show no significant difference in either the control or experimental groups.

## B. Area 2. Knowledge of Fundamental Concepts of Tonal Organization.

1. Reliability. The reliability coefficients suggest that this test is sufficiently reliable for evaluating the level of group accomplishment in Grade 4, Grade 5, Grade 6, or in Grades 4, 5, and 6 combined.

2. Experimental versus Control Groups. Since there was no significant difference in Pre Test results in either Grade 4 or Grade 5, the author assumes that the two groups in these grades were reasonably equated in this area.

However, in the Pre Tests of Grade 6 and Grades 4, 5, and 6 combined, the experimental group tested significantly higher. This would seem to indicate that these experimental groups began their training in the experiment with a significant advantage over the control group.

In his a posteriori study, the author found this unexpected result greatly disturbing. If the groups were equated, or even if the control group tested significantly higher than the experimental group in the Pre Tests but in subsequent tests the experimental group tested significantly higher than the control group (as was the case with Grade 6 in the Pre Tests of Area 1--Staff Knowledge) the favorable results of subsequent tests could be used to support the hypothesis of the study. However, in the case at hand, the author can only offer a comparison of the median scores of the Pre Tests and subsequent tests to support his claim that in Grade 6 and in Grades 4, 5, and 6 combined the experimental group was significantly higher (see Table XXXII, page L-1); for if the experimental group tested significantly higher in the Pre Tests, and a comparison of the median scores of subsequent tests revealed little or no disparity, the experiment for these grades in this area could well be invalid.

However, Table XXXII on page L-1 reveals that such is not the case; that a comparison of the median scores of Change Scores and Pre Tests shows much greater disparity in these median score comparisons than in the original disparity of the median scores of the pre tests. Thus, it appears to the author that the experiment for Grade 6 and Grades 4, 5, and 6 combined appears to be valid after all. The case for a valid experiment is further strengthened by the comparison of median score points gained in Pre Test to Post Test, Post Test to Terminal Test, and Pre Test to Terminal Test; the reader is now referred to this information which appears for both Grade 6 and Grades 4, 5, and 6 combined in Table XXXIII, page L-2. To summarize: (a) since there was a significant difference in all tests other than the Pre Tests in this area in Grade 6, and in Grades 4, 5, and 6 combined, (b) since in each case the experimental group tested significantly higher; (c) since the median scores of the experimental and control groups were very much more disparate in the tests subsequent to the Pre Tests than in the Pre Tests, and (d) since the median score of the experimental group became increasingly higher than that of the control group, it is, therefore the author's opinion that, despite the significantly higher Pre Test scores of the experimental group, there was a continual significant improvement of the learning increment of the experimental groups over and above that of the control groups throughout the experiment in this area of the study.

Since there was a significant difference in all tests other than the Pre Tests in this area in Grade 4 and in Grade 5, and since in each case the experimental group tested significantly higher, the author deduces that there was a continual significant improvement of the learning increment of the experimental groups over and above that of the control groups throughout the experiment in this area of the study in these grades.

3. Male versus Female Pupils in Grades 4, 5, and 6 Combined. In both the experimental and control groups, the fact that there were no significant difference in Pre Test results seems to indicate that male and female pupils of both groups were reasonably equated at the outset of the experiment.

In the control groups, the fact that there were no differences in any of the other test results seems to indicate that the male and female pupils of the control group remained equated throughout the experiment despite the training they received.

In the experimental groups, the fact that the female pupils tested significantly higher in the Change Scores (Post Test to Terminal Test) seems to indicate that the female pupils made a significant gain on an individual basis during the second semester of reinforced learning; however, the results of all the other tests seem to indicate that on a group basis there was no significant difference between male and female pupils of the experimental groups, and the Change Scores (Pre Test to Post Test) seem to indicate that on an individual basis there was no significant difference in gain during the first semester of training for male or female pupils of the experimental groups.

4. Level of Significance. Had the level of high significance (.01) been chosen rather than the .05 level of significance for this area, the results of all tests in this area would remain the same insofar as test decision is concerned.

C. Area 3. Rhythmic Discrimination.

1. Reliability. The reliability coefficients suggest that this test is reliable for Grade 5, Grade 6, and Grades 4, 5, and 6 combined, the level of significance in each case being .05 or less.

The negative reliability coefficient for Grade 4 suggests that this test is not reliable for Grade 4, the level of significance being considerably greater than .10 (see note "b" to Table V, page C-3); the guess factor probably contributed to this low coefficient. However, since the median scores for pilot and pre test were more equal in the tests for Grade 4 than they were in any other grade in this area, the author is reluctant to summarily reject the test on the grounds that it is unreliable.

2. Experimental versus Control Groups. Since there was no significant difference in Pre Test results in either Grade 4, Grade 5, Grade 6, or Grades 4, 5, and 6 combined, the author assumes that the two groups in these grades were reasonably equated in this area.

In Grade 5 and Grades 4, 5, and 6 combined, since there was no significant difference in any of the test results, the author assumes that the two groups in these grades remained equated in this area.

In Grade 4, the experimental group tested significantly higher in the Change Scores (Pre to Post) indicating a significant gain on an individual basis during the first semester. In view of the fact that no specific training in this area was given the experimental groups during the first semester, this appears to be an unexpected result. However, since the median scores for this test were tied at a score of zero, and the means were +.27 and -.62 for experimental and control groups respectively, the author submits that the gain or loss in terms of a perfect score of 10 was insignificant.

In Grade 6, where the control group tested significantly higher during the second semester, the author hastens to point out that the control group received training in this area during both semesters, whereas the experimental group received no training or up to two class periods of training in this area during the second semester only; yet the experimental and control median scores were, respectively, 0 and 1 for the Change Scores (Post Test to Terminal Test), 4 and 5 for the Terminal Tests. The unexpected result here is that the control group did not make a more decisive gain in view of the fact that the control group had many more periods of training. The author suspected that he had uncovered an effective method of training for rhythmic discrimination, but he had not guessed that it was effective to this extent within such a limited period of training time.

3. Trained versus Untrained Experimental Groups in Grades 4 and 6 During the Second Semester. Since there was no significant difference in either of the test results for Grade 4, the author assumes that the experimental method in this area for this grade was ineffective. The author credits this ineffectiveness to the extremely small amount of time spent on specific training in this area, and not to a basic flaw in the method itself.

Since the trained groups in Grade 6 did score significantly higher in the Terminal Test than the untrained experimental groups, the author assumes that the experimental method in this area for this grade was effective. Since an analysis of variance of the test results in Grade 6 of the trained experimental groups, the untrained experimental groups, and the control groups was not made, the author will not attempt to speculate on how much higher the significance of the results of the trained experimental groups in Grade 6 is.

4. Male versus Female Pupils in Grades 4, 5, and 6 Combined. In both experimental and control groups, the fact that there was no significant difference in Pre Test results seems to indicate that male and female pupils were reasonably equated at

the outset of the experiment in this area.

In the experimental groups, the fact that there was no significant difference in any test results except the Post Tests (in which the male pupils tested significantly higher) is an unexpected result inasmuch as there was no specific training in this area during the first semester. This fact also seems to indicate that during the second semester the male and female pupils remained equated; probably the small amount of time devoted to specific training in this area during the second semester was not sufficient to effect a significant difference in male and female pupils, if such a difference did exist.

In the control groups, the fact that there was no significant difference in any test results except the Change Scores (Post Test to Terminal Test) (in which the female pupils tested significantly higher) seems to indicate that during the first semester the male and female pupils remained equated despite the fact that they received specific training in this area, and only during the second semester did the female pupils make a significant gain on an individual basis; the gain in median score was only 1 point for the female pupils as compared with a zero median score gain for the male pupils (perfect score equals 10 points).

5. Level of Significance. Had the level of high significance (.01) been chosen rather than the .05 level of significance for this area, (a) the results of the experimental versus control groups would show no significant difference in any of the tests, (b) the results of the trained versus untrained experimental groups would remain the same insofar as test decision was concerned, (c) the results of male versus female pupils would show no significant difference in any of the tests.

D. Area 4. Interval Recognition

1. Reliability. The reliability coefficients suggest that this test is reliable for Grade 5, Grade 6, and Grades 4, 5, and 6 combined, the level of significance in each case being considerably lower than .0005 (see notes "c", "d", and "e" for Table VII, page D-2).

The reliability coefficient for Grade 4 suggests that this test is not reliable for Grade 4, the level of significance being considerably greater than .10 (see note "b" to Table VII, page D-2); the guess factor probably contributed to this low coefficient. Since the ranges of scores for pilot and pre tests were more equal in the tests for Grade 4 than they were in any other grade in this area, the author is reluctant to summarily reject the test on the grounds that it is unreliable.

2. Experimental versus Control Groups. Since there was no significant difference in Pre Test results in either Grade 4 or Grade 5, the author assumes that the two groups in these grades were reasonably equated at the outset of the experiment and remained equated throughout the experiment.

Since there was no significant difference in Pre Test results in Grade 6, the author assumes that the two groups in this grade were reasonably equated at the outset of the experiment. The fact that the experimental group tested significantly higher in the Post Tests might be attributed to the familiarity of the experimental group with the major scale as a result of frequent aural exposure to it during the course of specific training in scale formation, a part of the first semester's work in Area 2; the higher significance in the Post Tests cannot be attributed to specific training in this area, for none was given during the first semester.

The fact that the Pre Tests of Grades 4, 5, and 6 combined showed the experimental groups testing significantly higher in the Pre Test is not of great concern, since each grade (as mentioned above) was individually equated by the Pre Tests. The signficantly higher results of the experimental groups was probably produced by the significantly higher results of Grade 6 (see the preceding paragraph).

3. Trained versus Untrained Experimental Groups in Grade 6 During the Second Semester. Since there was no significant difference in any of the test results, the author assumes that the experimental method in this area was ineffective. The author credits this ineffectiveness to the extremely small amount of time spent on specific training in this area, and not to a basic flaw in the method itself.

4. Male versus Female Pupils in Grades 4, 5, and 6 Combined. In the experimental groups, although the male pupils tested significantly higher in the Pre Tests, the author is reluctant to make any assumption concerning this result since the median scores for the male and female pupils were only 3 and 2, respectively (the perfect score for this test is 20). Since there was no signficant difference in any of the other test results, the author assumes that male and female pupils remained equated for the remainder of the experiment; probably the small amount of time devoted to specific training in this area during the second semester was not sufficient to effect a significant difference in male and female pupils, if such a difference did exist.

In the control groups, the fact that there was no significant difference in any test results except the Change Scores (Post to Terminal Test) in which the female pupils tested significantly higher leads the author to assume that the male and female pupils were equated at the outset of the experiment, remained equated through the first semester, and only in the second semester did the female pupils make a significant score gain over the male pupils. However, the author does not make an assumption concerning these results since the median change scores for the male and female pupils were only zero and 1, respectively (the perfect score for this test is 20).

5. Level of Significance. Had the level of high significance (.01) been chosen rather than the .05 level of significance for this area, (a) the results of the experimental versus control groups would show no significant difference in any of the tests, (b) the results of the trained versus untrained experimental groups would remain the same insofar as test decision was concerned, (c) the results of the male versus female pupils in the experimental groups would remain the same insofar as test decision was concerned, but in the control groups the Change Scores (Post Test to Terminal Test) would show no significant difference.

## E. Area 5. Discrimination of Pitch Errors and the Ability to Correct Them

1. Reliability. The reliability coefficients suggest that this test is reliable for Grade 5, Grade 6, and Grades 4, 5, and 6 combined, the level of significance in each case being .01 or less.

The reliability coefficient for Grade 4 suggests that this test is not reliable for Grade 4, the level of significance being considerably greater than .10 (see note b to Table IX, page E-3); the guess factor probably contributed to this low coefficient.

2. Experimental versus Control Groups. Since there was no significant difference in Pre Test results in either Grade 4, Grade 5, Grade 6, or Grades 4, 5, and 6 combined, the author assumes that the two groups in these grades were reasonably equated in this area.

In Grade 4, and in Grade 5, since there was no significant difference in any of the test results, the author assumes that the two groups in these grades remained equated in this area throughout the experiment.

In Grade 6, the fact that the experimental group tested significantly higher in both Change Ranks (Pre Test to Post Test) and Post Tests is not sufficient ground on which to base any assumptions inasmuch as the gain in the median Change Ranks for experimental and control groups was only 1 and zero, respectively, and the median Post test ranks for experimental and control groups were only 3 and 2, respectively (the highest rank equals 26).

In Grades 4, 5, and 6 combined, the significantly higher results achieved by the experimental groups reflect those achieved by Grade 6 (see the preceding paragraph); the median Change Ranks were the same as those for Grade 6; the median Post Test ranks were tied at 2, the mean Post Test ranks for experimental and control groups being 3.80 and 2.91 respectively (the highest rank equals 26).

3. Male versus Female Pupils in Grade 4, 5, and 6 Combined. In the experimental groups, although the male pupils tested significantly higher in the Pre Tests, the author will not base any assumptions on this result since the median ranks for the male and female pupils were tied at 1. Although the male pupils tested significantly higher in the Post Tests, here again no assumptions are being made since the median ranks for male and female pupils are 3 and 2, respectively (the highest rank equals 26).

In the control groups, since there was no significant difference in any of the test results, the author assumes that the male and female pupils were equated at the outset of the experiment and remained equated throughout the experiment.

4. Level of Significance. Had the level of high significance (.01) been chosen rather than the .05 level of significance for this area, (a) the results of the experimental versus control groups would remain the same insofar as test decision was concerned for Change Ranks (Pre Test to Post Test), but the Post Tests would show no significant difference, (b) the male pupils versus the female pupils would show no significant difference in either the control or experimental groups.

F. Tests for Bias

1. Control versus Control[1] Groups in Grade 5 During the First Semester. Since there was no significant difference in any of the test results, the author assumes that there was no significant bias on the part of the author in teaching the Control groups in Grade 5 during the first semester in either Area 1 or Area 2 of the experiment. (The other three areas were not tested

for bias, inasmuch as no specific training was given the experimental groups in these latter areas during the first semester.)

2. *Control versus Control$^2$ Groups in Grade 6 During the Second Semester*. Since there was no significant difference in any of the test results of Area 1, Area 3, Area 4, or Area 5, the author assumes that there was no significant bias on the part of the author in teaching the control groups in Grade 6 during the second semester in any of these four areas.

The fact that there was a significant difference in the test results of Area 2 (Knowledge of Fundamental Concepts of Tonal Organization) would seem to indicate that there was significant bias on the part of the author in teaching the control groups of Grade 6 during the second semester in this one area. However, the author proposes that such is not the case; the median scores of the Control and Control$^1$ groups, respectively, were: 1 and zero for the Change Scores (Post Test to Terminal Test), 5 and 3 for the Terminal Tests (the perfect score for this test is 20). When compared with the median scores of the Experimental and Control groups, respectively, for the same measures, the amount of bias seems negligible: 4 and 0 for the Change Scores (Post Test to Terminal Test), 12 and 3 for the Terminal Tests.

3. *Level of Significance*. Had the level of high significance (.01) been chosen rather than the .05 level of significance for the tests of bias, all tests of bias would continue to show no significant difference for either grade in any test.

G. Tests for Retention.

In both Area 1 (Staff Knowledge) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization), since there is no significant difference in the scores of the Post Tests and Terminal Tests of Control$^3$ Grade 4 pupils, the author assumes that these pupils in this area did retain the learnings gained during the first semester throughout the second semester, though they received no specific training in these areas during the second semester. The author suspects that these pupils applied their acquired learnings from the first semester in an experimental group to the activities of the second semester in a control group; thus reinforcing, without teacher aid, their first semester learnings. Hence, the slight increase in their median scores and the rather incredible median rates of retention: 105¼% in Area 1 and 109% in Area 2.

# V. CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This study produced five original test instruments. Their reliability for evaluating the level of group accomplishment of upper elementary school pupils in each of five areas is as follows:

Area 1 (Staff Knowledge). This test is sufficiently reliable for Grade 5 and Grade 6, but not for Grade 4 or Grades 4, 5, and 6 combined.

Area 2 (Knowledge of Fundamental Concepts of Tonal Organization). This test is sufficiently reliable for Grades 4, 5, and 6 individually and combined.

Area 3 (Rhythmic Discrimination), Area 4 (Interval Recognition), and Area 5 (Discrimination of Pitch Errors and the Ability to Correct Them). These tests are sufficiently reliable for Grade 5, Grade 6, and Grades 4, 5, and 6 combined, but not for Grade 4.

Inasmuch as all five of the test instruments are sufficiently reliable for evaluating the level of group accomplishment of fifth and sixth grade pupils, it is recommended that they be used extensively to evaluate both existing and proposed programs in these grades in these areas. The Test of Knowledge of Fundamental Concepts of Tonal Organization, sufficiently reliable for evaluating the level of group accomplishment of fourth grade pupils, is recommended for extensive use in fourth grade as well as in fifth and sixth grade.

In Area 1 (Staff Knowledge) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization) this study has demonstrated:

(1) That after one semester of work, upper elementary pupils trained using the author's method test significantly higher than those pupils trained using a typical method.

(2) That after a second semester of work, upper elementary pupils receiving a reinforcement of the author's method test significantly higher than those pupils continuing their

training under a typical method. Of those who received reinforcement, fourth grade pupils completing the written classwork tested significantly higher than those who did not.

(3) That the typical training method produced no significant differences in male and female pupil test results, but the author's training method produced these significant differences: (a) male pupils tested significantly higher as a result of the initial semester of work in Area 1 (Staff Knowledge); (b) female pupils tested significantly higher as a result of the second semester of reinforcement in Area 2 (Knowledge of Fundamental Concepts of Tonal Organization).

(4) That pupils in fourth grade who were trained using the author's method during the first semester and a typical method during the second semester successfully retained the first semester's learning throughout the second semester.

Area 3 (Rhythmic Discrimination), Area 4 (Interval Recognition) and Area 5 (Discrimination of Pitch Errors and the Ability to Correct Them) were only peripheral areas of this study. In these three areas this study has demonstrated:

(1) That, after one semester, the groups taught by the author's method did not lag behind the groups taught by a typical method in any of the three areas. (During the first semester, the groups taught by the author's method included no specific training in these three areas; however, the groups taught by a typical method had training which assumedly included these three areas.) In fact, some groups taught by the author's method tested slightly higher than those taught by a typical method: the fourth grade in Area 3, and the sixth grade in Areas 4 and 5.

(2) That, after a second semester, sixth grade pupils who were taught by the author's method in Area 1 (Staff Knowledge) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization) during both semesters tested significantly higher in Area 3 (Rhythmic Discrimination) when given limited training in Area 3 during the second semester than when given no specific training in Area 3 during the second semester. In a similar experiment with fourth grade pupils, there was no significant difference in test results. This same type of experiment, but in Area 4 (Interval Recognition) with sixth grade pupils only, yielded no significant difference in test results.

(3) That, after a second semester, in Areas 3 and 4 there was no significant difference between groups taught by the author's method (including those groups who received limited training in Areas 3 and 4 as described in the preceding

paragraph) and groups taught by a typical method, except that the sixth grade groups taught by a typical method tested slightly higher than those taught by the author's method.

(4) That, after a second semester, in Area 5 (Discrimination of Pitch Errors and the Ability to Correct Them) there was no significant difference between groups taught by the author's method and groups taught by a typical method. (During both semesters the groups taught by the author's method received no specific training in this area; however, the groups taught by a typical method had training which assumedly included this area.)

(5) That there were no significant differences in male and female pupil test results, except (a) in the groups taught by the author's method, male pupils tested higher in the Post Tests of Area 3 (Rhythmic Discrimination), the Pre Tests of Area 4 (Interval Recognition) and the Pre Tests of Area 5 (Discrimination of Pitch Errors and the Ability to Correct Them); (b) in the groups taught by a typical method, female pupils tested higher in Change Scores (Post Test to Terminal Test) of Areas 3 and 4.

The results obtained in Area 1 (Staff Knowledge) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization) confirm the hypothesis of this study: that upper elementary pupils will more effectively acquire some basic skills for reading music when trained utilizing the combination of keyboard and programmed learning methods than by typical methods for teaching music reading skills.

The results obtained in Area 3 (Rhythmic Discrimination), Area 4 (Interval Recognition), and Area 5 (Discrimination of Pitch Errors and the Ability to Correct Them)—peripheral areas of this study—indicate that (1) there were not enough training periods in these areas to fully explore the potential of the author's methods, (2) typical methods are not successful in these three areas, (3) detailed methods (perhaps programmed materials) have to be developed to produce more successful learning in these three areas.

In view of the foregoing conclusions drawn from the results obtained in his study, the author has a number of observations to make, and some recommendations for ways in which the results of this study could be applied to existing programs and could be used to develop needed new programs:

(1) The author's methods were effective in a poverty area, in a transient neighborhood, in a school with diverse

ethnic origins in the inner city. The most striking support of this description comes from the Welfare Federation of Cleveland, particularly in one publication (14) which ranks 42 social planning areas of Cuyahoga County (including Greater Cleveland) from greatest poverty (1) to least poverty (42). This publication revealed that the Tremont (experimental school) area was ranked eighth, while the Corlett (control school) area was ranked seventeenth. The ranks were based on a composite of seven factors based on 1960 U. S. census figures and local sources: family income less than $3,000, male unemployment, education (per cent of population 25 years and over not completing eight school years), substandard housing units, Aid to Dependent Children cases, General Assistance cases, male official and unofficial delinquency complaints for boys 12 through 17 years of age.

More effective music programs are particularly needed in similar locales throughout our country to enlarge the limited horizons of life as led by disadvantaged children who are unfortunate enough to grow up in such situations.

(2) The author's methods were effective with pupils representing a wide range of intelligence. Although the pupils of both schools in which the study was conducted were equated by the author's five test instruments, the author did investigate the extent to which the groups were equated in other areas.

A comparison of certain intelligence tests given pupils in each of the two schools from October 1964 through March 1965 revealed that medians (based on mental age divided by chronological age) were 98.7 in the school receiving a typical method of instruction, but only 97.3 in the school receiving the author's method of instruction (2,3,4,5).

A comparison of results of Stanford Achievement Tests given pupils in each of the two schools from September 1964 through March 1965 reveals that the median grade evuivalents in the school receiving a typical method of instruction and in the school receiving the author's method of instruction, respectively, are (a) for fifth grade pupils, in reading: 5.9 and 5.5; in arithmetic: 5.5 and 5.6, (b) for sixth grade pupils, in reading: 6.8 and 6.6; in arithmetic: 7.5 and 6.8 (6,7,8,9).

In all the above cases, except one, the pupils taught a typical method of instruction tested slightly higher than pupils taught the author's method. This information is offered to point out the fact that the author's method is not a method which will only be effective with exceedingly bright pupils; in fact, many of the classes taught the author's method contained pupils whose I.Q.'s were far below normal.

(3) The author's method should be put into practical use. One of our aims as music educators should be to deepen our pupils interest in the performing art of music, so they may better derive value from it both as active listeners and as active performers. Although pupils can enjoy music as listeners or even as performers without musical notation, the reading of music is a valuable aid in awakening, developing, and maintaining pupil interest as well as promoting understanding in music. The ability to read music is a tool for sharpening the perceptiveness of the listener, and perceptive he must be if he is to partake of any aesthetic experience in music. Furthermore, an educated person, among other things, is a literate person, able to read; similarly, a musically educated person, among other things, must be musically literate, and able to read music.

Much time is devoted in elementary school to the purported teaching of the reading of music, but the fact remains that most pupils do not learn to read music unless they play an instrument. Perhaps there is no successful music reading program because many of the teachers who teach general music in the elementary schools are classroom teachers and do not read music themselves. Those who do read may not have discovered a successful method for teaching others. Even those who know how to read and how to teach may be overworked with oversized classes and with a limited time for music class and still less time for lesson preparation. If most music specialists do not have the time, although some have the ability, to prepare music reading lessons which are well thought-out and presented even to the smallest detail so as to provide adequate context, focus, socialization, individualization, sequence, and evaluation (13), surely classroom teachers do not.

The author is not suggesting his method as a "cure-all". However, it can be used to good advantage by the classroom teacher. Classroom teachers can become interested and able as they learn with the class using the programmed learning materials developed. The aid of apt pupils may be enlisted by the teacher to assist with much of the drill required. Pupils may be paired to practise keyboard skills. It is recommended that the programmed learning materials be widely disseminated for use by classroom teachers responsible for the music education of their pupils.

The music specialist in the elementary school may find it difficult to add to the programmed materials presented by this study, since there is a paucity of such materials specifically directed to upper elementary school children. The music specialist is urged to develop needed new programmed materials in the classroom. It has been suggested to the author that he further his research in the continued development of programmed (or highly detailed) instructional materials for all five areas of this study so as to eventually produce a complete basic music reading program in the upper elementary schools.

# VI. SUMMARY

Problem. Upper elementary school pupils do not learn to read music independently in general (vocal) music classes. This is due in part to the lack of an effective individualized method designed for classroom use, as well as to the widely varying degrees of music reading readiness each pupils represents, the diversity of methods to which each pupils is exposed, and the music reading incompetency of classroom teachers with little or no special training in music.

Hypothesis. Upper elementary pupils will more effectively acquire some basic skills for reading music when trained utilizing the combination of keyboard and programmed learning methods than by typical methods for teaching music reading skills.

Method. Five original test instruments are developed in the following areas for the purpose of equating groups and evaluating achievement:

Area 1. Staff Knowledge
Area 2. Knowledge of Fundamental Concepts of Tonal Organization.
Area 3. Rhythmic Discrimination
Area 4. Interval Recognition.
Area 5. Discrimination of Pitch Errors and the Ability to Correct Them.

These tests are administered three times during the school year: at the beginning (Pre Tests) and end (Post Tests) of the first semester and at the end (Terminal Tests) of the second semester.

All upper elementary classes at one Cleveland public school are designated control groups; upper elementary classes at another Cleveland public school are designated experimental groups.

During both semesters, the control groups follow a typical course on general (vocal) music study. During the first semester, the experimental groups receive specific training in Area 1 (Staff Knowledge) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization), using the author's method which includes for Area 1 visual aids which introduce the grand staff as a graph of the keyboard and for Area 2 programmed instructional materials utilizing numbered paper keyboards as well as one piano per class. The second semester provides for a study of reinforced learning, retention, and a probe of Area 3 (Rhythmic Discrimination) and Area 4 (Interval Recognition) using the experimental groups.

The reliability of the tests are determined by Kuder-Richardson reliability coefficients and Spearman rank correlation coefficients. The results of Pre, Post, and Terminal Tests, as well as Change Scores (Pre Test to Post Test and Post Test to Terminal Test) are analyzed by the Mann-Whitney U test. Tests pertaining to retention are analyzed by the Wilcoxon matched-pairs signed-ranks test. The level of significance for the study is set at .05.

Results. The hypothesis is accepted at $\alpha = .05$, but the hypothesis is also valid at $\alpha = .01$.

Inasmuch as all five of the test instruments are sufficiently reliable for evaluating the level of group accomplishment of fifth and sixth grade pupils, it is recommended that they be used extensively to evaluate both existing and proposed programs in these grades and areas. The Test of Knowledge of Fundamental Concepts of Tonal Organization, sufficiently reliable for evaluating the level of group accomplishment of fourth grade pupils, is recommended for extensive use in fourth grade as well as in fifth and sixth grade.

In Area 1 (Staff Knowledge) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization) this study has demonstrated that (1) after one semester of work, upper elementary pupils trained using the author's method tested significantly higher than those pupils trained using a typical method, (2) after a second semester of work, upper elementary pupils receiving a reinforcement of the author's method tested significantly higher than those pupils continuing their training under a typical method, (3) pupils who were trained using the author's method during the first semester and a typical method during the second semester successfully retained the first semester's learning throughout the second semester.

The results obtained in Area 3 (Rhythmic Discrimination), Area 4 (Interval Recognition), and Area 5 (Discrimination of Pitch Errors and the Ability to Correct Them)—peripheral areas of this study—indicated that (1) there were not enough training periods in the probes of these areas to fully explore the potential of the author's methods, although test results indicated the potential does exist; (2) a typical method is not successful in these three areas; (3) detailed methods (perhaps programmed materials) have to be developed to produce more successful learning in these areas.

Recommendations. The author's method was effective in a poverty area, in a transient neighborhood, in a school with diverse ethnic origins in the inner city. More effective music programs are particularly needed in similar locales throughout our country. The author's method was effective with pupils representing a wide range of intelligence (many of the classes taught the author's method contained pupils whose I.Q.'s were far below normal), so the author's method is not one which will only be effective with exceedingly bright pupils.

The programmed learning materials should be particularly helpful to classroom teachers who have had no special music training, but are responsible for the music education of their pupils. These teachers can become interested and able as they learn with their classes.

The music specialist in the elementary school is urged to develop more detailed (perhaps programmed) materials to supplement those offered in this study.

Continued development of programmed materials for all five areas outlined in this study would seem desirable and fruitful for music education.

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## APPENDIX A. TEST OF STAFF KNOWLEDGE

### A. Pilot Test of Staff Knowledge

The Pilot Test of Staff Knowledge, along with the pilot tests in the other four areas of this experiment, was administered as a closing activity in June 1964 to all fourth, fifth, and sixth grade pupils in the experimental school. (This experimenter was not assigned the control school until September 1964; hence control school pupils were not included in the pilot test.). Before the June 1964 tests none of the experimental procedures were taught to the pupils involved in the experiment. All pupils were on summer vacation after that date, and there is no evidence to show that they received any training during the vacation period.

The Pre Test of Staff Knowledge, along with the pre tests in the other four areas of this experiment, was administered as an opening activity to all fourth, fifth, and sixth grade pupils in both experimental and control schools, when school resumed in September 1964.

The Pre Test of Staff Knowledge was a revision of the Pilot Test of Staff Knowledge, revised during the summer of 1964. The pilot test had the following shortcomings (see Fig. A1):

1. Each item of the pilot test had a blank line upon which the pupil was to print the letter response. The printing of many of the pupils was illegible.

2. There were fifty unnumbered items in the pilot test, all printed on one page, using a liquid duplicator process of reproduction for the test forms needed. These characteristics accounted for a crowded format, and a test form difficult to score and reprint.

3. The correct responses of the pilot test were arranged in such a manner that the pupil could automatically score six items correctly if he repeated the musical alphabet, "A, B, C, D, E, F, G" seven times in that order and added "A" for the last item (see Fig. A2). In scoring the pilot tests it became apparent that many pupils were using this pattern of response.

4. There was no heading on the pilot test, and no blank lines were provided for pertinent information to be filled in by the pupil. (Pupils were given instructions for placing this information on the reverse side of the test paper, but uniformity was not obtained.).

The following changes were incorporated into the Pre Test of Staff Knowledge (this form of the test being used for Post and Terminal Tests as well):

1. Each item of the revised test has the seven possible letter responses printed under each item; this eliminated the possibility of illegible printing on the part of the pupil.

2. The revised test has forty numbered items, printed on two pages, with a mimeograph process of reproduction employed for the test forms needed. The reduction to forty items allowed for an equal division of G clef and F clef notes, as well as an equal division of staff and extended staff notes. The two pages provided better spacing, legibility, and standardization of format. The mimeograph process proved more satisfactory for reprinting.

3. The pattern of correct responses was altered in the revised test to prevent the pupil from automatically scoring six items correctly by using the pattern of response described above as a shortcoming of the pilot test.

4. A heading and page number appeared on both pages of the revised test. Appropriate blank lines for pupil information were provided on the reverse side of page two.

The instructions for the pilot test were changed to suit the revisions made; except for such changes, the instructions remained the same for both tests.

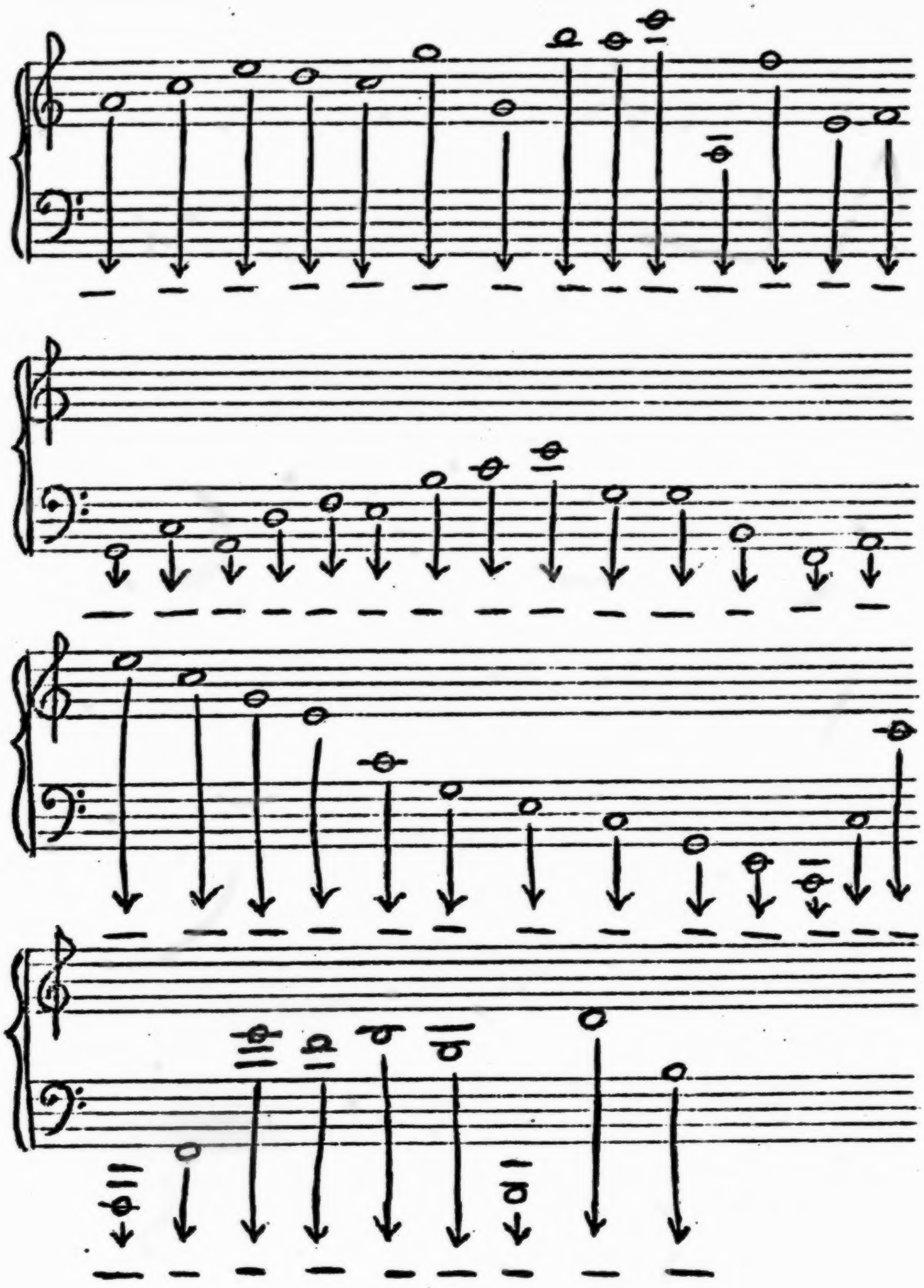


Fig. A1.--Pilot Test of Staff Knowledge (Facsimile).

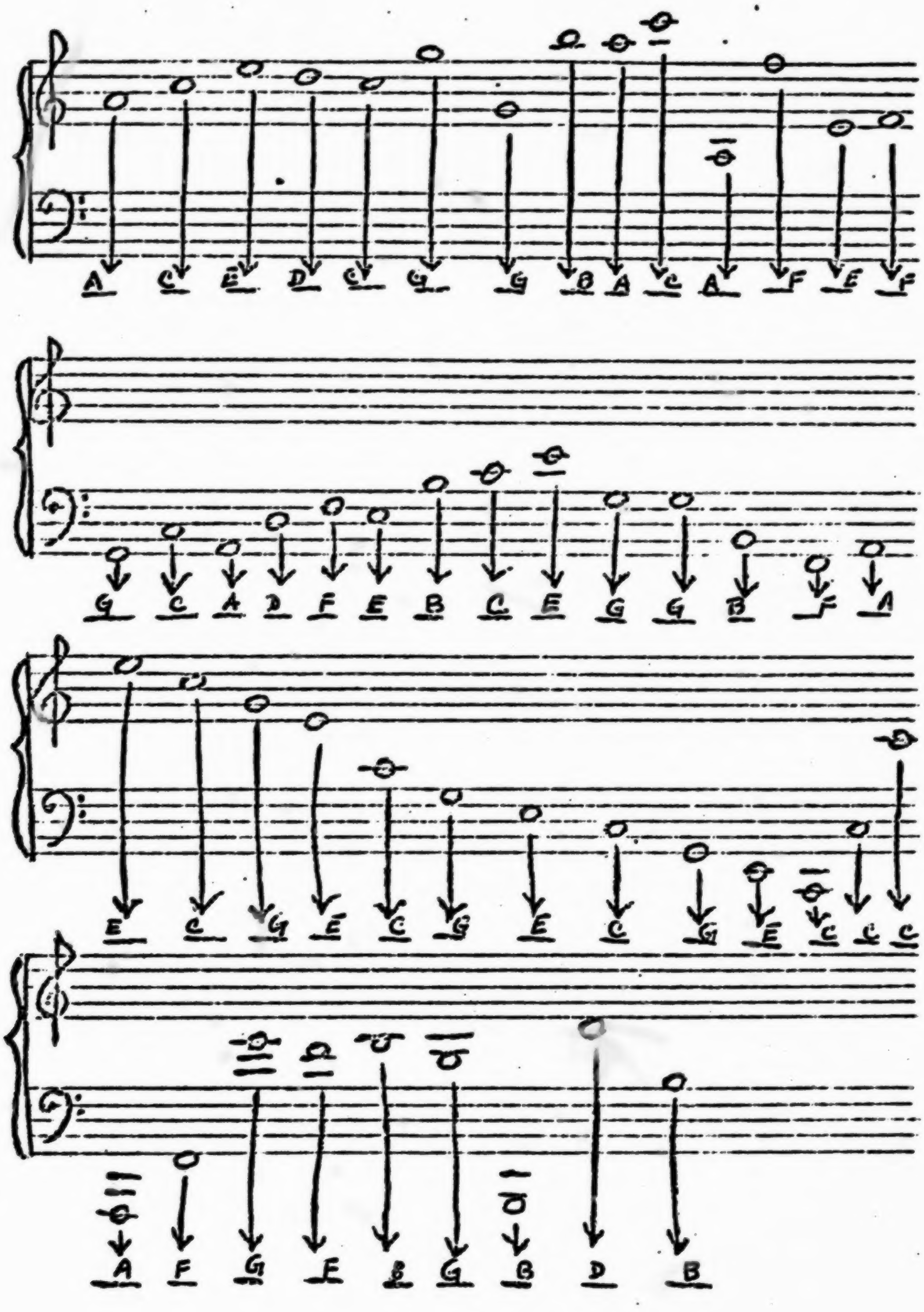

A C E D C G G B A C A F E F
G C A D F E B C E G G B F A
E C G E C G E C G E C C C
A F G E B G B D B

Fig. A2.--Pilot Test of Staff Knowledge
(Facsimile marked showing correct responses).

## B. Reliability of the Test of Staff Knowledge

Because the Pilot Test of Staff Knowledge was revised, a Spearman Rank Correlation Coefficient relating pilot and pre tests (such as had been obtained in three areas of this experiment in which pilot test revision was unnecessary) was of no value.

Instead, a Kuder-Richardson reliability test was run on all the Staff Knowledge Pre Tests given to both experimental and control groups. The Kuder-Richardson formula ($r_{xx}$) of "rational equivalence", based upon item-total score interrelationships, was the formula (16) used.

According to Kelley, a reliability coefficient of .50 is necessary to evaluate the level of group accomplishment (17), but Whybrew suggests that a coefficient of less than .50 may be justified if it is the best measure available (17).

It will be noted in the following table that the reliability coefficient for Fourth Grade is much below the suggested .50 value; this in turn lowered the "Fourth, Fifth, and Sixth Grades Combined" coefficient for the Experimental Group to slightly below the .50 value.

It is felt that the guess factor contributed to these low reliability coefficients, as witness the extremely low ranges of scores for the Fourth Grade.

All of the other results fall above the .50 value.

## TABLE I

### TEST OF STAFF KNOWLEDGE PRE TESTS: KUDER-RICHARDSON RELIABILITY COEFFICIENTS ($r_{xx}$)

| Group | N | $r_{xx}$ | Median[a] (Perfect Score=40) | Range of Scores |
|---|---|---|---|---|
| | | | Fourth Grade | |
| Experimental. | 122 | .11 | 5.6 | 0-15 |
| Control...... | 92 | .27 | 5.7 | 0-19 |
| Experimental and Control Combined... | 214 | .17 | 5.6 | 0-19 |
| | | | Fifth Grade | |
| Experimental. | 101 | .61 | 5.5 | 1-20 |
| Control...... | 59 | .79 | 5.8 | 0-26 |
| Experimental and Control Combined... | 160 | .71 | 5.6 | 0-26 |
| | | | Sixth Grade | |
| Experimental. | 123 | .55 | 6.6 | 1-21 |
| Control...... | 71 | .84 | 7.6 | 1-32 |
| Experimental and Control Combined... | 194 | .75 | 6.6 | 1-32 |
| | | | Fourth, Fifth, and Sixth Grades Combined | |
| Experimental. | 346 | .48 | 5.6 | 0-21 |
| Control...... | 222 | .79 | 6.5 | 0-32 |
| Experimental and Control Combined... | 568 | .66 | 5.7 | 0-32 |

[a] Based on scores ("No. Right") of Test of Staff Knowledge Pre Tests.

C. Instructions for Administering Test of Staff Knowledge

1. PREPARATION

Materials Needed for Each Pupil

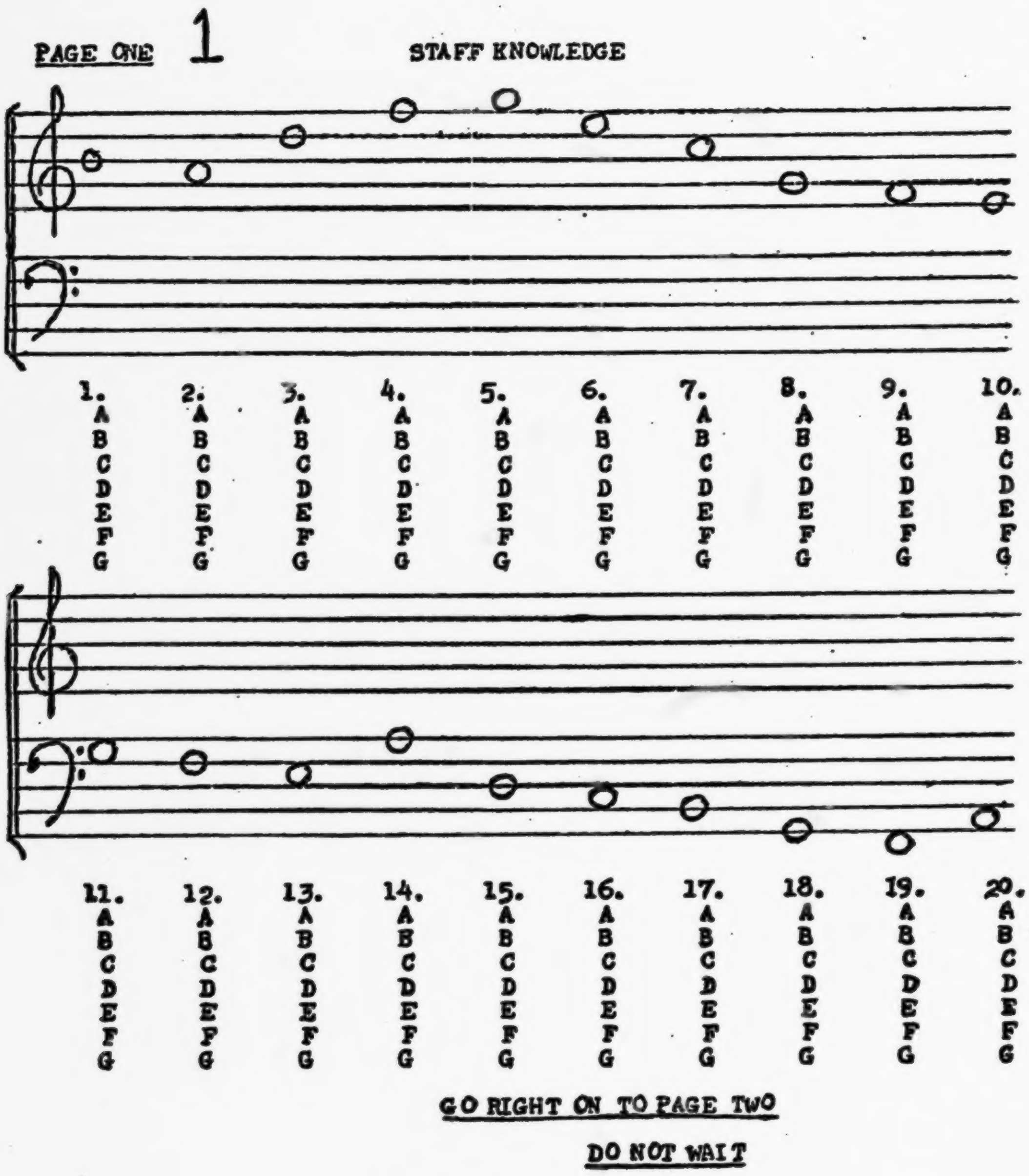
Chair;
Writing surface to accomodate 8½ x 11 inch paper (desk, table, or folding-arm chair);
Two sharpened pencils (erasers not required);
Two-page stapled (in the upper left-hand corner) test entitled "Staff Knowledge" (see Fig. A3.).

Materials Needed for the Proctor

Bulletin board or blackboard space for posting previously prepared visual aids (see Fig. A4) and thumb tacks if the former is used;
Masking tape for affixing visual aids to each other, and for mounting master aids if blackboard space is used;
Table, or preferably a chalk tray, for the additional visual aids needed;
Pointer for proctor to use in pointing to visual aids;
A sample of the test paper to be used in giving instructions (see Fig. A3);
Sign to be affixed face outward to door of room: "TESTING. PLEASE DO NOT KNOCK OR ENTER";
Watch with a sweep second hand for timing each individual testee;
Large placards numbered to show the desk number of each pupil, placed for easy viewing by the proctor on each pupil's desk before admitting the testees to the test room (see Fig. A5);
Time Sheet (with numbers corresponding to desk numbers) on which proctor can record the total minutes and seconds required by each pupil to complete the test (see Fig. A6).

2. PROCEDURE

Allow forty minutes for the administration of this test. This time period includes provision for seating the pupils, giving the pupils the necessary instructions for the test, allowing extensive time for questioning by the pupils, distributing the test papers, allowing fifteen minutes maximum for test completion,



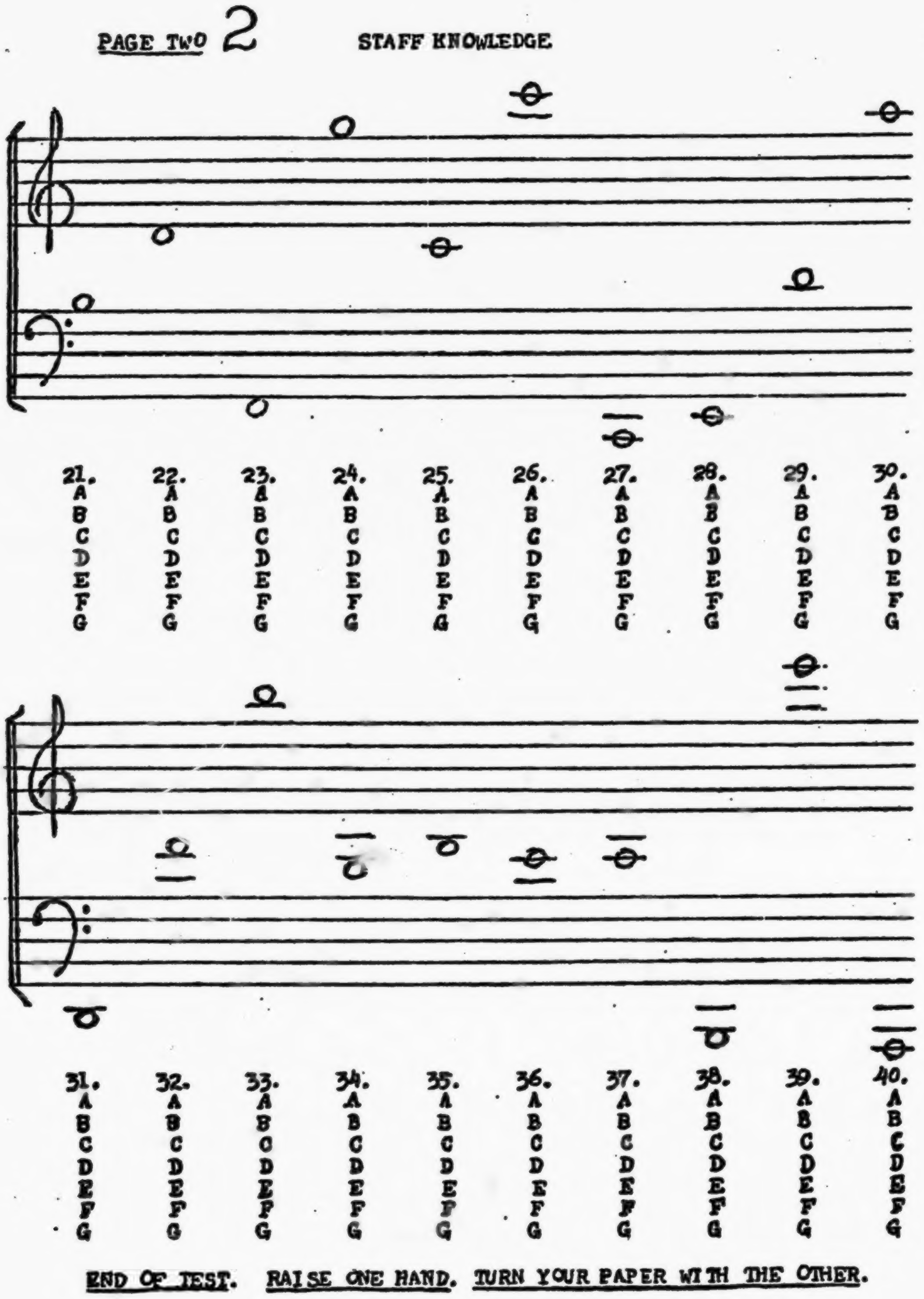
**PAGE ONE** 1 STAFF KNOWLEDGE

1. A B C D E F G
2. A B C D E F G
3. A B C D E F G
4. A B C D E F G
5. A B C D E F G
6. A B C D E F G
7. A B C D E F G
8. A B C D E F G
9. A B C D E F G
10. A B C D E F G
11. A B C D E F G
12. A B C D E F G
13. A B C D E F G
14. A B C D E F G
15. A B C D E F G
16. A B C D E F G
17. A B C D E F G
18. A B C D E F G
19. A B C D E F G
20. A B C D E F G

**GO RIGHT ON TO PAGE TWO**

**DO NOT WAIT**

Fig. A3a.--Test of Staff Knowledge, Page One (Facsimile).



PAGE TWO 2 STAFF KNOWLEDGE

21. A B C D E F G
22. A B C D E F G
23. A B C D E F G
24. A B C D E F G
25. A B C D E F G
26. A B C D E F G
27. A B C D E F G
28. A B C D E F G
29. A B C D E F G
30. A B C D E F G

31. A B C D E F G
32. A B C D E F G
33. A B C D E F G
34. A B C D E F G
35. A B C D E F G
36. A B C D E F G
37. A B C D E F G
38. A B C D E F G
39. A B C D E F G
40. A B C D E F G

END OF TEST. RAISE ONE HAND. TURN YOUR PAPER WITH THE OTHER.

Fig. A3b.--Test of Staff Knowledge, Page Two (Facsimile).

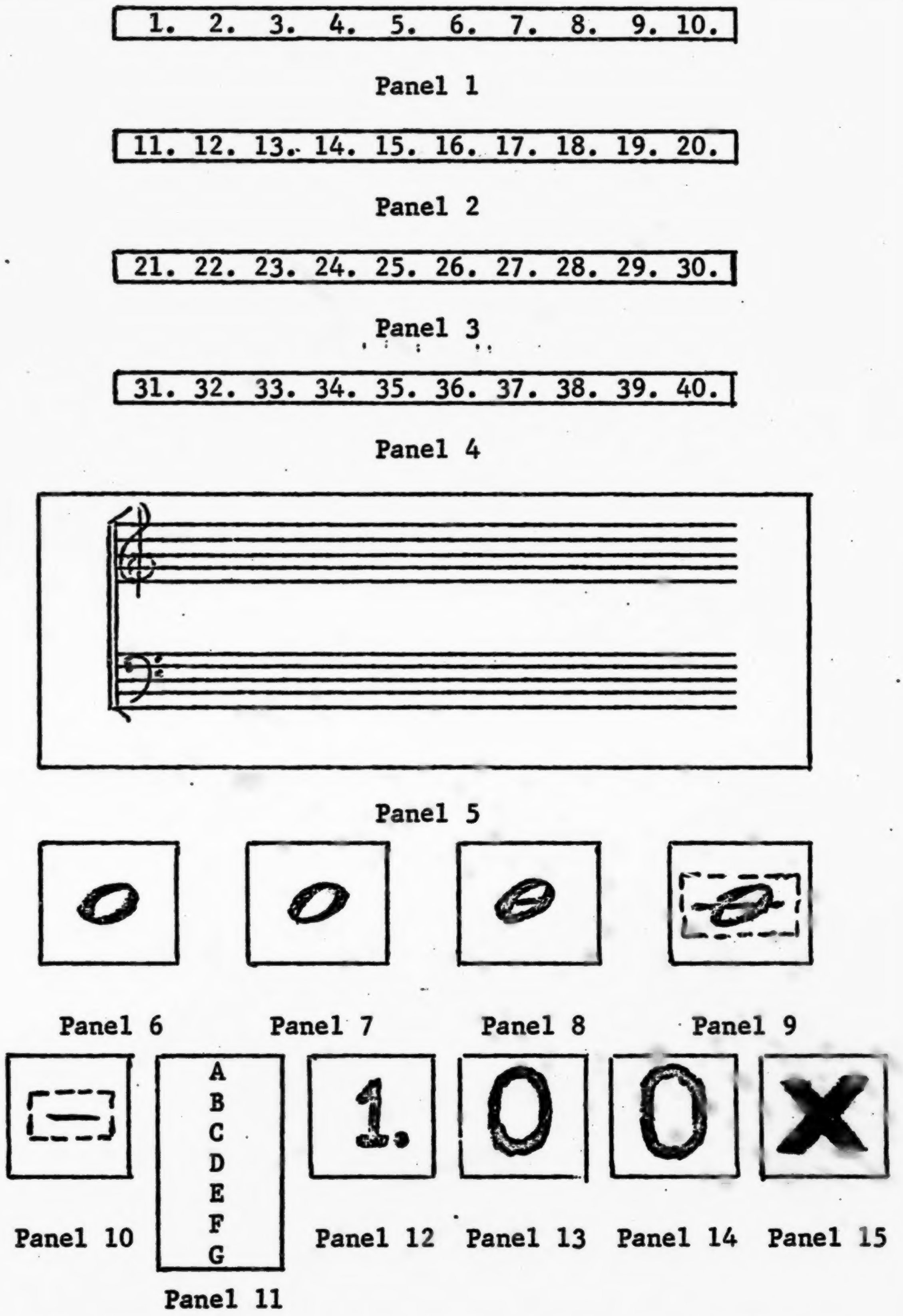

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.
Panel 1
11. 12. 13. 14. 15. 16. 17. 18. 19. 20.
Panel 2
21. 22. 23. 24. 25. 26. 27. 28. 29. 30.
Panel 3
31. 32. 33. 34. 35. 36. 37. 38. 39. 40.
Panel 4
Panel 5
Panel 6
Panel 7
Panel 8
Panel 9
Panel 10
A
B
C
D
E
F
G
Panel 11
1.
Panel 12
0
Panel 13
0
Panel 14
X
Panel 15

Fig. A4.--Test of Staff Knowledge visual aids.

(For an explanation of the construction of these visual aids, see "Explanation of Fig. A4 on Page A-10" on page A-11.)

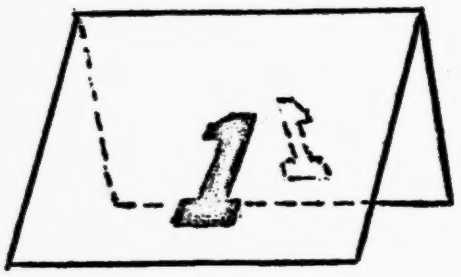


Fig. A5.--Test of Staff Knowledge
Desk Number Card used in timing test.

(For an explanation of the construction of this visual aid, see "Explanation of Fig. A5 on Page A-11"appearing below. )

<ins>Explanation of Fig. A4 on Page A-10</ins>. All panels were made from white poster board and inked with black "Speedry" ink. All panels were made large enough to be seen clearly from any point in the room. The author made Panels 1 through 4, 5" x 27"; Panel 5, 20" x 15"; Panel 6, 8" x 14"; Panel 11, 28" x 8"; Panel 12, 4-3/4" x 3". The notes in Panels 7 and 8 were cut out around their outlines. Panels 9 and 10 were cut on the dotted lines. Both the insides and outsides of the circles in Panels 13 and 14 were cut out. Panel 15's "X" was cut out around its outline. The circles of Panels 13 and 14 were made large enough to encircle the letters printed on Panel 11 (the author's circles were 3" in diam.). The "X" of Panel 15 used by the author was 3" square, being large enough to "cross out" the circles and letters of Panels 11 and 13. The notes of Panels 7 through 9 must be made to fit the size of the spaces of the staffs on Panel 5. The author ruled the lines of the staffs of Panel 5 to be 1¼" apart, with a distance of 5" between the two staffs of the grand staff. The leger lines of Panels 9 and 10 were made 3" in length.

<ins>Explanation of Fig. A5 on Page A-11</ins>. The Desk Number Cards were made from white poster board and a different number inked on each with black "Speedry" ink. They measured 16" x 8", and were folded in half so that when they were placed on each pupil's desk the matching numbers inscribed on both 8" square halves were simultaneously visible to both the proctor and the pupil.

Room No._____ Time Test Ended____:____:____

Date of Test_____ Time Test Began____:____:____

| Desk No. | Min. & Sec. for Test Completion | Desk No. | Min. & Sec. for Test Completion |
|---|---|---|---|
| 1. | | 22. | |
| 2. | | 23. | |
| 3. | | 24. | |
| 4. | | 25. | |
| 5. | | 26. | |
| 6. | | 27. | |
| 7. | | 28. | |
| 8. | | 29. | |
| 9. | | 30. | |
| 10. | | 31. | |
| 11. | | 32. | |
| 12. | | 33. | |
| 13. | | 34. | |
| 14. | | 35. | |
| 15. | | 36. | |
| 16. | | 37. | |
| 17. | | 38. | |
| 18. | | 39. | |
| 19. | | 40. | |
| 20. | | 41. | |
| 21. | | 42. | |

Fig. A6.--Test of Staff Knowledge Time Sheet.

collecting the test papers, and dismissing the pupils.

As soon as the pupils are seated and quiet, the PROCTOR states:

"During our next several meetings, you will do five different music tests. All five tests will help show me how well you read and listen to music. Many of you may not know how to read music, because many of you may never have been taught how to read music. But all of you can do your best, and carefully follow the instructions I give. If you do these two things I will be very pleased. Today we will just do the first test. It is called, 'Staff Knowledge'. I will tell you what to expect and what to do, even before I give you the test papers."

(PROCTOR picks up sample test paper).

"The test will be on two pages stapled together..."

(PROCTOR briefly holds up and shows sample pages one and two.).

"...and there will be forty problems in all. On the first page you will do problems one through ten..."

(PROCTOR holds up Panel 1 of Fig. A4.).

"...at the top of the page, and problems eleven through twenty..."

(PROCTOR holds up Panel 2 of Fig. A4.).

"...at the bottom of the page. You will go right on to page two, with problems twenty-one through thirty..."

(PROCTOR holds up Panel 3 of Fig. A4.).

"...at the top of page two, and problems thirty-one through forty..."

(PROCTOR holds up Panel 4 of Fig. A4.).

"...at the bottom of page two to finish the test."

(PROCTOR moves to the left of Panel 5 of Fig. A4.).

"Printed across the whole page above each of the four lines of problem numbers I just showed you, you will find a grand staff like this."

(PROCTOR points to Panel 5 of Fig. A4.).

"These lines..."

(PROCTOR places left and right hands at the left hand end of the staffs of Panel 5 of Fig. A4, palms toward the panel, so that the left hand fingers and thumb point to the five G clef lines and the right hand fingers and thumb point to the five F clef lines.)

"...will be all the way across your paper."

(PROCTOR walks to the right as he says the above words, moving both hands along to the right tracing the lines of the grand staff, and continuing off the right hand edge to show that the staff on the paper will be longer than that shown in Panel 5 of Fig. A4.).

(PROCTOR picks up Panel 6 of Fig. A4.).

"On that grand staff will be placed notes."

(PROCTOR holds up Panel 6 of Fig. A4.).

"Ten notes will be printed on each grand staff."

(PROCTOR puts down Panel 6 of Fig. A4 and picks up Panel 7 of Fig. A4.).

"Some notes will be high on the grand staff."

(PROCTOR affixes Panel 7 of Fig. A4 between third and fourth lines of the G clef on Panel 5 of Fig. A4.).

"Some notes will be low on the grand staff."

(PROCTOR removes Panel 7 of Fig. A4 from the G clef, and affixes it between the second and third lines of the F clef on Panel 5 of Fig. A4.).

"Some of the notes will seem to have lines through them..."

(PROCTOR removes Panel 7 of Fig. A4 from Panel 5 of

Fig. A4, and picks up Panel 8 of Fig. A4.).

"...like this..."

(PROCTOR affixes Panel 8 of Fig. A4 to Panel 5 of Fig. A4 so that the horizontal line of Panel 8 meets the fourth line of the G clef of Panel 5 on both ends.).

"...or..."

(PROCTOR removes Panel 8 of Fig. A4, puts it down, and picks up Panel 9 of Fig. A4.).

"...like this..."

(PROCTOR affixes Panel 9 of Fig. A4 to Panel 5 of Fig. A4 so that it appears as the first leger line above the G clef.).

"...or..."

(PROCTOR removes Panel 9 of Fig. A4 and affixes it so that it appears as the first leger line below the G clef on Panel 5 of Fig. A4.).

"...like that, or..."

(PROCTOR removes Panel 9 of Fig. A4 and affixes it so that it appears as the first leger line below the F clef on Panel 5 of Fig. A4.).

"...like that."

(PROCTOR removes Panel 9 of Fig. A4, puts it down, and picks up Panel 10 of Fig. A4.).

"Sometimes one or more of these short lines..."

(PROCTOR holds up and shows Panel 10 of Fig. A4 to the class.).

"...will be above the grand staff..."

(PROCTOR moves Panel 10 of Fig. A4 up and down twice in the area above the grand staff of Panel 5 of Fig. A4.).

"...or somewhere near the middle of the grand staff..."

(PROCTOR moves Panel 10 of Fig. A4 up and down twice in the area between the treble and bass staffs of Panel 5 of Fig. A4.).

"...or below the grand staff. Sometimes notes will appear just above or below or between these short lines."

(PROCTOR moves Panel 10 of Fig. A4 up and down twice in the area below the grand staff of Panel 5 of Fig. A4, and then puts down Panel 10.).

"Now this is very important: each of the forty notes in the test can be named. Instead of being named like people, notes have letter names."

(PROCTOR picks up Panel 11 of Fig. A4, holds it up, and shows it to the class.).

"Each note will be named with one of the first seven letters of the alphabet; either A or B or C or D or E or F or G. These seven letters are printed forty times, just below each of the problem numbers which are just below each of the forty notes."

(PROCTOR puts down Panel 11 of Fig. A4, picks up Panel 6 of Fig. A4 with his right hand, and moves to the left of Panel 5 of Fig. A4.).

"For example, in Problem One, you will see a note..."

(PROCTOR holds up Panel 6 of Fig. A4 for the class to see.).

"...printed some place..."

(As the sentence is completed, PROCTOR appropriately moves left hand index finger in a straight line across the surface and from the top to the bottom of Panel 5 of Fig. A4, simulating the same distance from the clef signs as the first note is from the clef signs on the actual test paper.).

"...above, or on the higher part, or near the middle of, or on the lower part, or below the grand staff."

(PROCTOR puts down Panel 6 of Fig. A4 and picks up Panels 11 and 12 of Fig. A4.).

"Right under that note will be the problem number."

(PROCTOR affixes Panel 12 of Fig. A4 beneath Panel 5 of

Fig. A4, directly under the line just traced by the left hand index finger.).

"Under the number will be the seven letter names."

(PROCTOR affixes Panel 11 of Fig. A4 directly beneath Panel 12 of Fig. A4, and picks up Panel 13 of Fig. A4.).

"You will circle with your pencil the one letter..."

(PROCTOR, standing to the left of Panels 5, 13 and 12, appropriately moves Panel 13 of Fig. A4 to encircle each of the letters of Panel 12 of Fig. A4 as he names the letters thereon.).

"...(A, B, C, D, E, F, or G)..."

(As the sentence is completed, PROCTOR retraces the line made earlier with the left hand index finger from the top to the bottom of Panel 5 of Fig. A4.).

"...that correctly names the note that was printed above the problem number. If you are not sure, please guess. If you think you have circled the wrong letter, and wish to circle a different letter, do not erase;..."

(PROCTOR still holding Panel 13 of Fig. A4, picks up Panel 15 of Fig. A4, and holds up the latter panel for the class to see.).

"...just put an "X" over the letter you circled by mistake, and circle another letter instead."

(PROCTOR moves to the left of Panel 11 of Fig. A4.).

"For example, let us suppose you had circled 'A' for Problem One."

(PROCTOR affixes Panel 13 of Fig. A3 to encircle the "A" on Panel 11 of Fig. A4, and picks up Panel 14 of Fig. A4.).

"Let us suppose you decided that 'A' was the wrong letter to circle. You would then put an 'X' over the 'A'..."

(PROCTOR affixes Panel 15 of Fig. A4 to "cross out" Panel 13 of Fig. A4 which is encircling the "A" on Panel 11 of Fig. A4.).

"...and circle another letter of your choice: either..."

(As the sentence is completed, PROCTOR circles each of the six letters on Panel 11 of Fig. A4 as they are named, using Panel 14 of Fig. A4.).

"...B or C or D or E or F or G. Remember, in each of the forty problems you will choose from these seven letter names (printed under each problem number)..."

(PROCTOR quickly points from the top to the bottom of Panel 11 of Fig. A4.).

"...the one letter that you think correctly names each of the forty notes in the test. To show the letter of your choice, you circle it with your pencil. Are there any questions?

(PROCTOR answers PUPILS' questions, if there are any, before proceding with the subsequent instructions, repeating any of the above instructions and using any of the visual aids which are applicable.).

"Now I will distribute the test papers. Do not write anything on them or even touch them until I tell you what to do next."

(PROCTOR distributes test papers, placing them face down on each pupil's desk.).

"This test will be timed, so we will all start together. For this reason, I am asking you not to turn over to page one to begin the test, until I tell you to. Now pick up your pencil and print or write clearly your full name on the line at the top of the page, just after the words, 'Full Name'. After the word, 'Grade', put ____."

(PROCTOR designates either 4B, 4A, 5B, 5A, 6B, or 6A; whichever is applicable.).

"After the word, 'Room', put_____."

(PROCTOR designates the room number to be inserted.).

"After the word, 'Desk Number', copy the number from the cardboard on your desk(see Fig. A5). Put your pencil down when you have finished copying the Desk Number. Do not fill in the time or the date. Pencils down, please. When I tell you to---

not now---you will turn the papers over and begin with Problem One on Page One, circling the letter you think correctly names each note. When you finish the twenty problems on the first page, do not wait, but go right on to finish the last twenty problems on Page Two. The moment you finish the last problem, Problem Forty on Page Two, you will put your pencil down and at the same time raise your hand."

(During the last paragraph of instruction, and for the remainder of the instruction period, PROCTOR must be alert to the possibility that some pupils will attempt to turn the test pages, and must be ready to reiterate, "Do not touch the test papers.").

"Let us practise this. Raise one hand. Keep that hand raised. With your other hand, do not touch the test paper, but pretend (like this)..."

(PROCTOR, with one hand raised, uses other hand to pretend to turn over imaginary paper in the air.).

"...to turn the paper back over as you see it now."

(PROCTOR keeps one hand raised.).

"Be sure to keep your hand raised high, watching me until I point to you to put it down. Let us practise this. Keep your hand up until I point to you; then put it down."

(PROCTOR points to four or five students near the front of the room so that the class can grasp the procedure.).

"Everybody put down your hand now. Once your hand is down, you may do no more work on the test. Therefore, if you want to check over your work, you must check it before you raise your hand. Once your hand is down, remain quiet until everyone has finished. Are there any other questions?"

(PROCTOR answers PUPILS' questions, if there are any, before proceding with the following final instructions before the test begins.).

"Listen carefully now. The 'Staff Knowledge' test is about to start. You are to remember to circle the correct letter name for each of the notes on the two pages. Now, pick up your pencil and have it ready. I will count down from ten, and then you will turn to Page One and begin the test. Ready..."

(PROCTOR holds watch with sweep second hand in his one hand, and holds the other hand high in the air with index finger pointed upward. PROCTOR begins the countdown ten seconds before the minute, and brings his upraised arm swiftly down as he says "...turn...".).

"...ten, nine, eight, seven, six, five, four, three, two, one, turn and begin!".

(PROCTOR records the time the test began on the Time Sheet, shown in Fig. A6. He also records the Room Number and the Date of Test. He makes note of time to the nearest second when each pupil raises a hand to show he has completed the test, and records these times in minutes and seconds, placing the figures separated by a colon to the right of the numbers on the Time Sheet which correspond to the Desk Numbers. When the last time total has been recorded or when fifteen minutes has elapsed---whichever comes first---that time is recorded as the ending time. Then continue as indicated below.).

"Give me your attention, please. This is the end of the 'Staff Knowledge' Test."

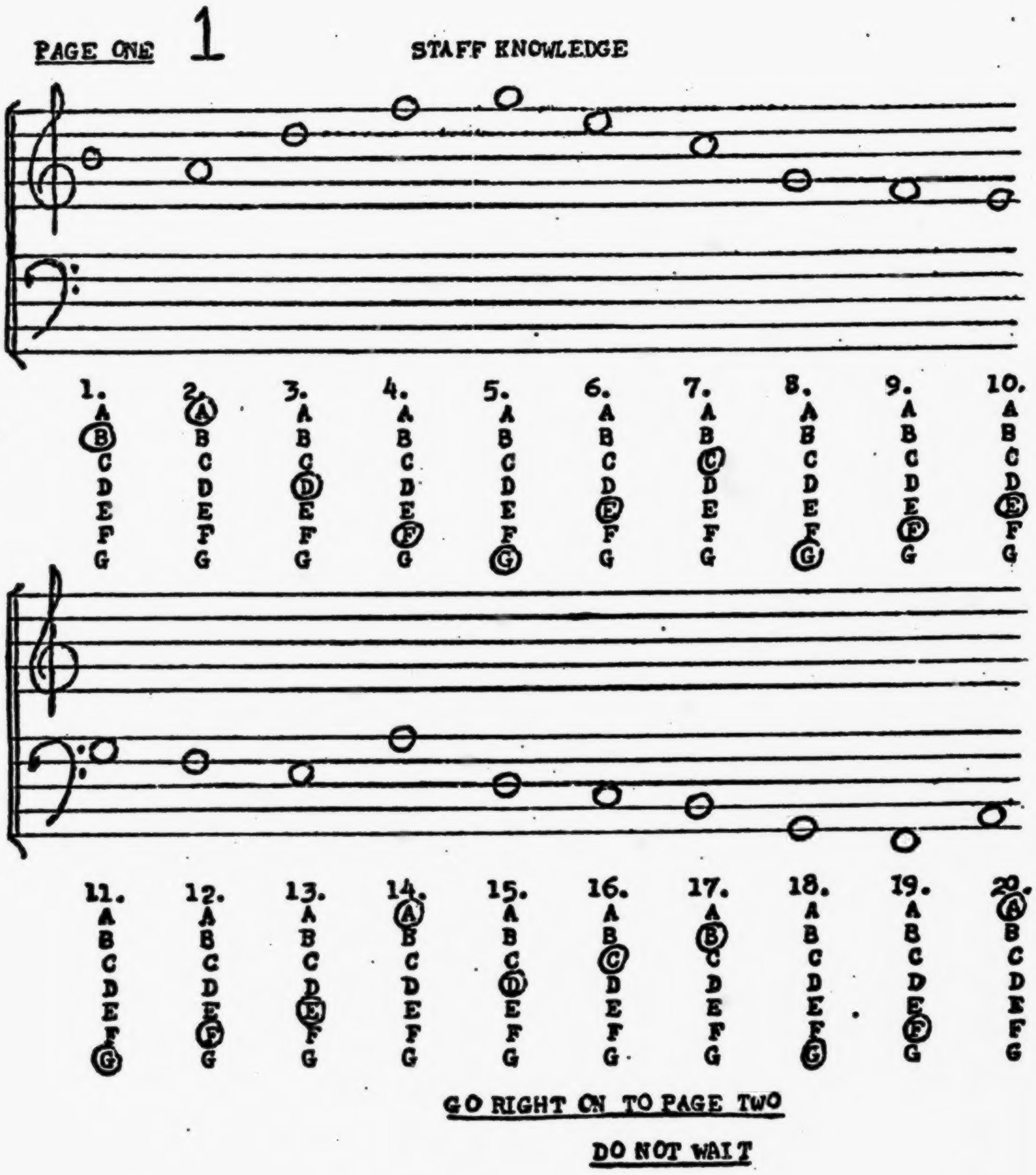
(PROCTOR gives necessary instructions for collecting papers and for class dismissal.).

## D. Instructions for Scoring Test of Staff Knowledge

1. Based on the correct responses to the test (see Fig.A7), two templates were designed to aid in correcting pages one and two of the test. The rectangtangles of these two templates (see Figs. A8 and A9) are to be cut out before the latter are used.

2. Follow the scoring procedure indicated in "3." (below) and score each page two of a group of tests, before following the same procedure for page one. Prepare the test papers of each group by folding page one under page two of each test. After scoring with the template for page two, total the number of incorrect responses on page two, and record that number in the upper right hand corner of page two and also in the upper right hand corner of page one. Then fold page two under page one of each test. After scoring with the template for page one, total the number of incorrect responses on page one, and record that total directly under the total number of incorrect responses for page two which were previously entered in the upper right hand corner of page one. The sum of these two incorrect response totals equals the "No. Wrong". Consult the Scoring Table (see Table II) for the "Percentage Score" and "No. Right".

3. Using the appropriate template (Fig. A8 and A9), employ a red pencil to make an "X" over the correct letter response for each item that was not correctly responded to by the testee. Also use a red pencil to mark "//" over all letters in any item where more than one response was made by the testee. Red pencil marks will thus indicate incorrect responses. If the testee pencilled an "X" over any letter or letters, such response (s) are to be ignored. Thus, if the testee pencilled an "X" over the correct response, it is still to be marked with a red "X" by the scorer to indicate an incorrect response; if the testee pencilled an "X" over an incorrect response, the scorer will mark the item only on the basis of the letter or letters circled by the testee. The scorer must also be alert to the possibility of a testee entering his response to an item by printing one of the seven letter names inside one of the circled note heads on the staff directly above the problem number. In such a situation, the scorer would not find any items circled, and should remove the template to ascertain if such a method has been employed by the testee. If such is the case, the scorer should circle the letter beneath the problem number for each item in accordance with the letter improperly indicated by the testee above that same problem number, and then follow the normal scoring procedure indicated above.


PAGE ONE 1

STAFF KNOWLEDGE

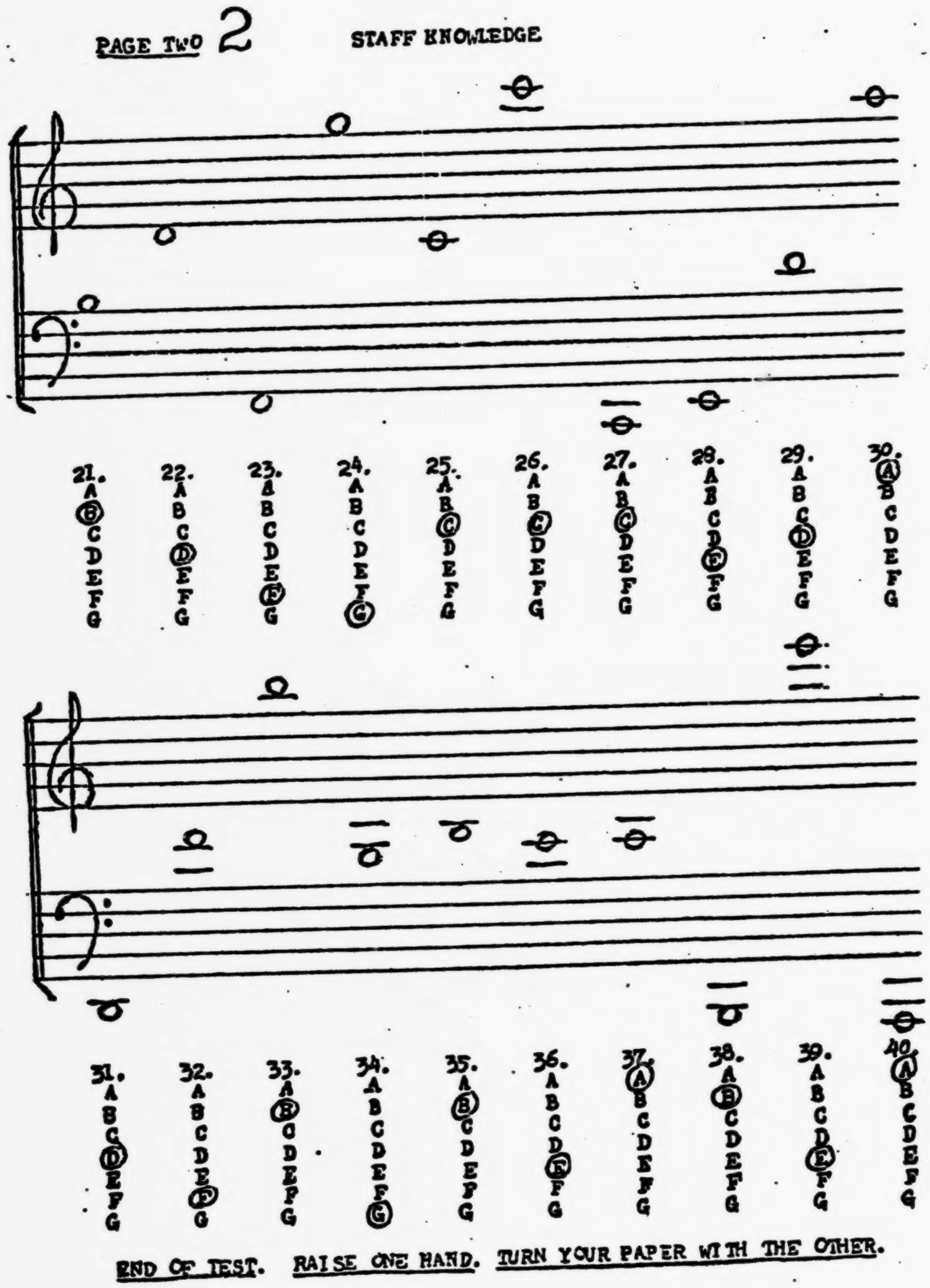
1. A [✓ B] C D E F G
2. [✓ A] B C D E F G
3. A B C [✓ D] E F G
4. A B C D E [✓ F] G
5. A B C D E F [✓ G]
6. A B C D [✓ E] F G
7. A B [✓ C] D E F G
8. A B C D E F [✓ G]
9. A B C D E [✓ F] G
10. A B C D [✓ E] F G

11. A B C D E F [✓ G]
12. A B C D E [✓ F] G
13. A B C D [✓ E] F G
14. [✓ A] B C D E F G
15. A B C [✓ D] E F G
16. A B [✓ C] D E F G
17. A [✓ B] C D E F G
18. A B C D E F [✓ G]
19. A B C D E [✓ F] G
20. [✓ A] B C D E F G

GO RIGHT ON TO PAGE TWO

DO NOT WAIT

Fig. A7a.--Test of Staff Knowledge, Page One (Facsimile marked showing correct responses).



PAGE TWO 2 STAFF KNOWLEDGE

21. A [✓ B] C D E F G
22. A B C [✓ D] E F G
23. A B C D E [✓ F] G
24. A B C D E F [✓ G]
25. A B [✓ C] D E F G
26. A B [✓ C] D E F G
27. A B [✓ C] D E F G
28. A B C D [✓ E] F G
29. A B C [✓ D] E F G
30. [✓ A] B C D E F G

31. A B C [✓ D] E F G
32. A B C D E [✓ F] G
33. A [✓ B] C D E F G
34. A B C D E F [✓ G]
35. A [✓ B] C D E F G
36. A B C D [✓ E] F G
37. [✓ A] B C D E F G
38. A [✓ B] C D E F G
39. A B C D [✓ E] F G
40. [✓ A] B C D E F G

END OF TEST. RAISE ONE HAND. TURN YOUR PAPER WITH THE OTHER.

Fig. A7b.--Test of Staff Knowledge, Page Two (Facsimile marked showing correct responses).

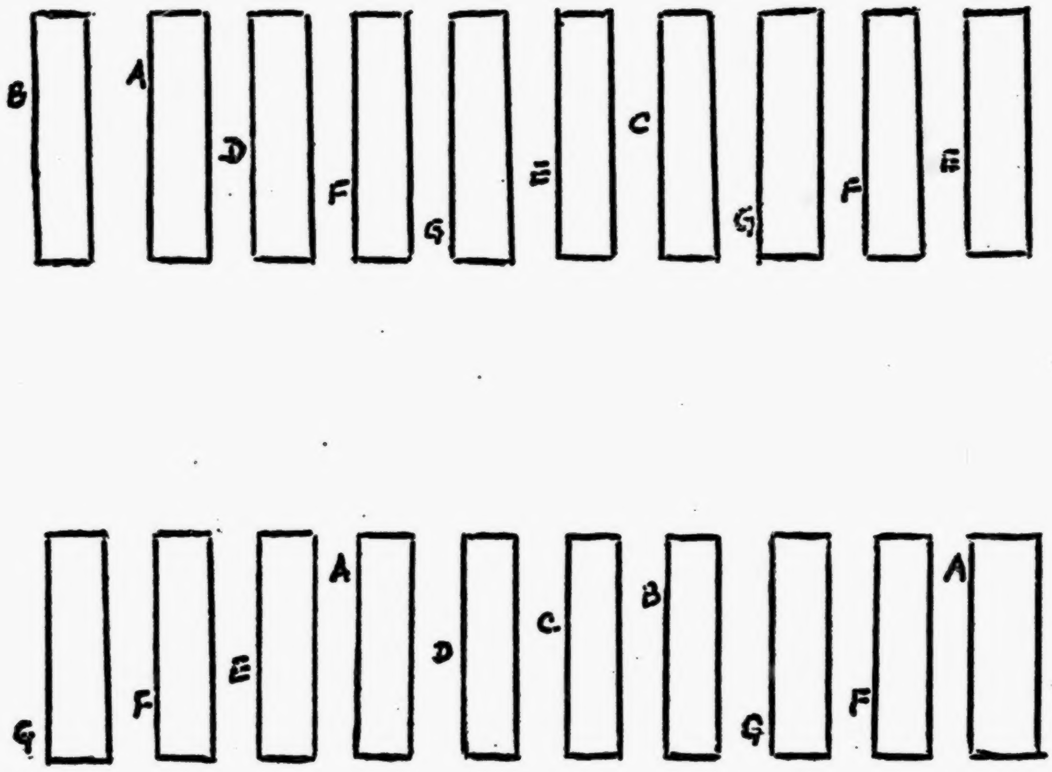

B
A
D
F
G
E
C
G
F
E
G
F
E
A
D
C
B
G
F
A

Fig. A8.--Test of Staff Knowledge Scoring Template for Page One of test.

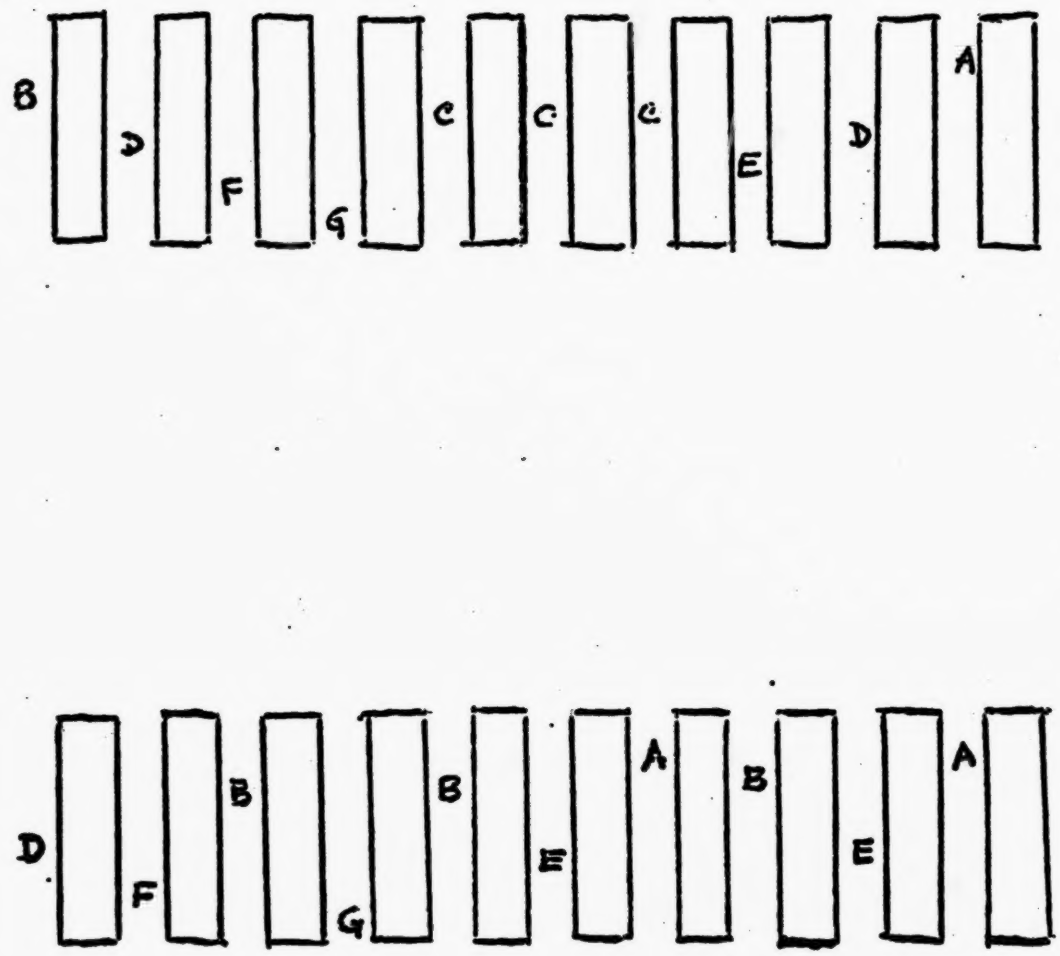

B
D
F
G
C
C
C
E
D
A
D
F
B
G
B
E
A
B
E
A

Fig. A9.--Test of Staff Knowledge Scoring Template for Page Two of test.

## TABLE II

## TEST OF STAFF KNOWLEDGE SCORING TABLE

| No. Wrong | Percentage Score | No. Right |
|---|---|---|
| 0 | 100.0 | 40 |
| 1 | 97.5 | 39 |
| 2 | 95.0 | 38 |
| 3 | 92.5 | 37 |
| 4 | 90.0 | 36 |
| 5 | 87.5 | 35 |
| 6 | 85.0 | 34 |
| 7 | 82.5 | 33 |
| 8 | 80.5 | 32 |
| 9 | 77.5 | 31 |
| 10 | 75.0 | 30 |
| 11 | 72.5 | 29 |
| 12 | 70.0 | 28 |
| 13 | 67.5 | 27 |
| 14 | 65.0 | 26 |
| 15 | 62.5 | 25 |
| 16 | 60.0 | 24 |
| 17 | 57.5 | 23 |
| 18 | 55.0 | 22 |
| 19 | 52.5 | 21 |
| 20 | 50.0 | 20 |
| 21 | 47.5 | 19 |
| 22 | 45.0 | 18 |
| 23 | 42.5 | 17 |
| 24 | 40.0 | 16 |
| 25 | 37.5 | 15 |
| 26 | 35.0 | 14 |
| 27 | 32.5 | 13 |
| 28 | 30.0 | 12 |
| 29 | 27.5 | 11 |
| 30 | 25.0 | 10 |
| 31 | 22.5 | 9 |
| 32 | 20.0 | 8 |
| 33 | 17.5 | 7 |
| 34 | 15.0 | 6 |
| 35 | 12.5 | 5 |
| 36 | 10.0 | 4 |
| 37 | 7.5 | 3 |
| 38 | 5.0 | 2 |
| 39 | 2.5 | 1 |
| 40 | 0.0 | 0 |

Note: "No. Right" used for ranking purposes.

This experimenter also entered the following information on each test paper:

1. The time required by the testee to complete the test. This information was obtained by the "Time Sheet" for each group (see "Instructions for Administering Test of Staff Knowledge", Fig. A6).

2. The date of the test.

3. A test identification number. A number was assigned each test paper, numbering from the highest score in the lowest grade level to the lowest score in the highest grade level.

4. The percentage score of each test (obtained from Table II of these instructions).

(Items 3 and 4 above were entered on each pupil's Data Sheet.).

# APPENDIX B. TEST OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION

## A. Pilot Test Of Knowledge of Fundamental Concepts of Tonal Organization

The Pilot Test of Knowledge of Fundamental Concepts of Tonal Organization, along with the pilot tests in the other four areas of this experiment, was administered as a closing activity in June 1964 to all fourth, fifth, and sixth grade pupils in the experimental school. (This experimenter was not assigned the control school until September 1964; hence control school pupils were not included in the pilot test.). Before the June 1964 tests none of the experimental procedures were taught to the pupils involved in the experiment. All pupils were on summer vacation after that date, and there is no evidence to show that they received any training during the vacation period.

The Pre Test of Knowledge of Fundamental Concepts of Tonal Organization, along with the pre tests in the other four areas of this experiment, was administered as an opening activity to all fourth, fifth, and sixth grade pupils in both experimental and control schools, when school resumed in September 1964.

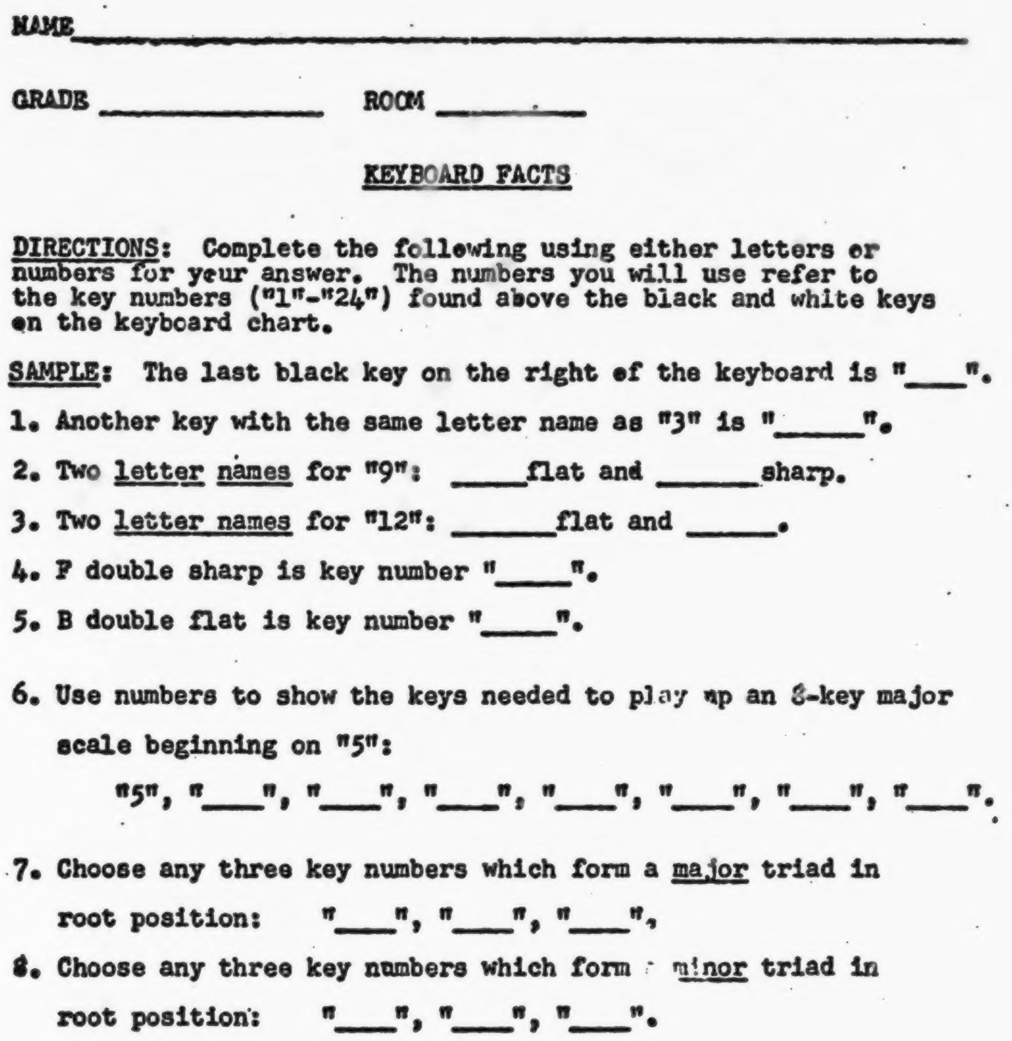
The Pre Test of Knowledge of Fundamental Concepts of Tonal Organization was a revision of the Pilot Test of Knowledge of Fundamental Concepts of Tonal Organization, revised during the summer of 1964. The pilot test had the following shortcomings (see Fig. B1):

1. The directions, "Complete the following using either letters or numbers", were not clear in the pilot test, and had to be reinterpreted to the testees so that the latter would know to use numbers for all items except Problems 2 and 3 which required letter responses.

2. The pilot test did not test knowledge of half and whole steps, although half and whole step knowledge was a feature of the experimental group's training in fundamental concepts of tonal organization.

3. The pilot test did not offer enough items for each type of fundamental concept, particularly in the areas of scale building and triad formation.

4. Problems 7 and 8 of the pilot test did not specify a key number on which to build; this allowed the testees to select only white keys for roots if they wished, and the great number of



NAME ______________________________________________

GRADE ______________ ROOM ________

KEYBOARD FACTS

DIRECTIONS: Complete the following using either letters or numbers for your answer. The numbers you will use refer to the key numbers ("1"-"24") found above the black and white keys on the keyboard chart.

SAMPLE: The last black key on the right of the keyboard is "___".

1. Another key with the same letter name as "3" is "_____".
2. Two letter names for "9": _____flat and ______sharp.
3. Two letter names for "12": _______flat and _____.
4. F double sharp is key number "_____".
5. B double flat is key number "_____".
6. Use numbers to show the keys needed to play up an 8-key major scale beginning on "5":
   "5", "____", "____", "____", "____", "____", "____", "____".
7. Choose any three key numbers which form a major triad in root position: "___", "___", "___".
8. Choose any three key numbers which form a minor triad in root position: "___", "___", "___".

Fig. B1.--Pilot Test of Knowledge of Fundamental Concepts of Tonal Organization (Facsimile).

possible correct answers made scoring these two items tedious (see Fig. B2).

5. In the twenty item pilot test, the number of response blanks per problem gave too much weight to some problems and not enough to others.

The following changes were incorporated into the Pre Test of Knowledge of Fundamental Concepts of Tonal organization (this form of the test being used for Post and Terminal Tests as well):

1. In the revised test, the directions and problems requiring key number responses were separated from those that required letter name responses.

2. In the revised test, knowledge of half and whole steps was included.

3. In the revised test, the number of items in the areas of scale building and triad formation was triple the number of items in the pilot test.

4. In the revised test, the roots of triads were specified and occurred on both black and white keys; this limited the correct response to one possibility, and made scoring simple.

5. In the revised test, with the exception of Problems 4 through 6, all the responses to a problem had to be correct in order for the problem to be scored as correct. In Problems 4 through 6, all the responses to each of the three sub-sections of these problems had to be correct in order for each subsection to be scored as correct. The resulting twenty items were more evenly weighted than in the pilot test.

NAME________________________________________

GRADE ____________ ROOM ________

## KEYBOARD FACTS

**DIRECTIONS:** Complete the following using either letters or numbers for your answer. The numbers you will use refer to the key numbers ("1"-"24") found above the black and white keys on the keyboard chart.

**SAMPLE:** The last black key on the right of the keyboard is "23".

1. Another key with the same letter name as "3" is "15".
2. Two letter names for "9": A flat and G sharp.
3. Two letter names for "12": C flat and B.
4. F double sharp is key number "8". (OR "20")
5. B double flat is key number "10". (OR "22")
6. Use numbers to show the keys needed to play up an 8-key major scale beginning on "5":
"5", "7", "9", "10", "12", "14", "16", "17".
7. Choose any three key numbers which form a major triad in root position: "___", "___", "___".
8. Choose any three key numbers which form a minor triad in root position: "___", "___", "___".

1, 5, 8
2, 6, 9
3, 7, 10
4, 8, 11
5, 9, 12
6, 10, 13
7, 11, 14
8, 12, 15
9, 13, 16

10, 14, 17
11, 15, 18
12, 16, 19
13, 17, 20
14, 18, 21
15, 19, 22
16, 20, 23
17, 21, 24

1, 4, 8
2, 5, 9
3, 6, 10
4, 7, 11
5, 8, 12
6, 9, 13
7, 10, 14
8, 11, 15
9, 12, 16

10, 13, 17
11, 14, 18
12, 15, 19
13, 16, 20
14, 17, 21
15, 18, 22
16, 19, 23
17, 20, 24

Fig. B2.--Pilot Test of Knowledge of Fundamental Concepts of Tonal Organization (Facsimile marked showing correct responses).

## B. Reliability of the Test of Knowledge of Fundamental Concepts of Tonal Organization

Because the Pilot Test of Knowledge of Fundamental Concepts of Tonal Organization was revised, a Spearman Rank Correlation Coefficient relating Pilot and Pre Tests (such as had been obtained in three areas of this experiment in which pilot test revision was unnecessary) was of no value.

Instead, a Kuder-Richardson reliability test was run on all the Fundamental Concepts of Tonal Organization Pre Tests given to both experimental and control groups. The Kuder-Richardson formula of "rational equivalence", based upon item-total score interrelationships, is the formula (16) which was employed.

According to Kelley, a reliability coefficient of .50 is necessary to evaluate the level of group accomplishment (17).

It will be noted from the following table that all the results satisfy the .50 value.

## TABLE III

## TEST OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION PRE TESTS: KUDER-RICHARDSON RELIABILITY COEFFICIENTS ($\underline{r_{xx}}$)

| Group | N | $\underline{r_{xx}}$ | Median[a] (Perfect Score=20) | Range of Scores |
|---|---|---|---|---|
| | | | Fourth Grade | |
| Experimental. | 113 | .62 | 1.7 | 0-5 |
| Control...... | 91 | .55 | 1.7 | 0-5 |
| Experimental and Control Combined... | 204 | .60 | 1.6 | 0-5 |
| | | | Fifth Grade | |
| Experimental. | 99 | .63 | 2.7 | 0-7 |
| Control...... | 61 | .73 | 1.7 | 0-8 |
| Experimental and Control Combined... | 160 | .67 | 2.6 | 0-8 |
| | | | Sixth Grade | |
| Experimental. | 117 | .61 | 2.8 | 0-7 |
| Control...... | 73 | .63 | 2.5 | 0-8 |
| Experimental and Control Combined... | 190 | .61 | 2.7 | 0-8 |
| | | | Fourth, Fifth, and Sixth Grades Combined | |
| Experimental. | 329 | .63 | 2.6 | 0-7 |
| Control...... | 225 | .64 | 1.7 | 0-8 |
| Experimental and Control Combined... | 554 | .64 | 1.8 | 0-8 |

[a] Based on scores ("No. Right") of Test of Knowledge of Fundamental Concepts of Tonal Organization Pre Tests.

## C. Instructions for Administering Test of Knowledge of Fundamental Concepts of Tonal Organization

### 1. PREPARATION

Materials Needed for Each Pupil

Chair;
Writing surface to accomodate 8½ x 11 inch paper keyboard (desk or table);
Two sharpened pencils (at least one with pencil eraser, or a separate pencil eraser);
One-page test entitled, "Keyboard Facts" (see Fig. B3);
One paper keyboard, entitled, Panel I" (see Fig. B4).

Materials Needed for the Proctor

A sample of the test paper (see Fig. B3);
A sample of the paper keyboard (see Fig. B4);
Two sharpened pencils;
Sign to be affixed face outward to door of room: "TESTING. PLEASE DO NOT KNOCK OR ENTER.".

### 2. PROCEDURE

Allow forty minutes for the administration of this test. This time period includes provision for seating pupils, distributing the test papers and paper keyboards face up on each pupil's desk, giving the necessary instructions for the test, questioning by the pupils concerning the instructions, test completion by the pupils, a check of each test paper by the proctor to be sure all items have been completed according to the instructions, subsequent checks as necessary, collecting the test papers, and dismissing the pupils. As soon as the pupils are seated, the PROCTOR distributes the test papers, face up, and then states:

"Give me your attention, please. Today, we will do the test called, 'Keyboard Facts'. While I am distributing the paper keyboards you will need to complete the test, please fill in the empty lines at the top of your test paper, above the words, 'Keyboard Facts'. Print or write clearly your full name, your grade (PROCTOR designates which: 4A, 4B, 5A, 5B, 6A, 6B) and your room number (PROCTOR supplies this number). Then put your pencil down and wait for further instructions. Do not write on the paper keyboard."

(PROCTOR distributes a paper keyboard, face up, to each

FULL NAME_______________________________________GRADE_______ROOM_______

### KEYBOARD FACTS

DIRECTIONS FOR PROBLEMS 1 THROUGH 11: Complete the following using numbers for your answers. The numbers you will use are the key numbers ("1" through "24") above the black and white keys on Panel I.

Sample: The last black key on the right of the keyboard is key number "___".

1. Another white key with the same letter name as key number "3" is key number "___".

2. Key numbers "___" and "___" are both called "F double sharp".

3. Key numbers "___" and "___" are both called "B double flat".

4. Use numbers to show the keys needed to play up three 8-key major scales beginning with the following numbers:

"5", "___", "___", "___", "___", "___", "___", "___".

"7", "___", "___", "___", "___", "___", "___", "___".

"11", "___", "___", "___", "___", "___", "___", "___".

5. Choose the other two numbers which will form major triads (3-note chords) in root position above each of the following three numbers:

| "4", "___", "___" | "9", "___", "___" | "12", "___", "___" |

6. Choose the other two numbers which will form minor triads (3-note chords) in root position above each of the following three numbers:

| "2", "___", "___" | "3", "___", "___" | "11", "___", "___" |

7. A whole step higher than key number "15" is key number "___".

8. A whole step higher than key number "17" is key number "___".

9. A half step higher than key number "8" is key number "___"

10. A half step higher than key number "11" is key number "___".

11. A half step higher than key number "12" is key number "___".

DIRECTIONS FOR PROBLEMS 12 THROUGH 14: Complete the following using letters (A, B, C, D, E, F, or G) for your answers.

Sample: The first letter in the alphabet is "___".

12. "___" flat and "___" sharp are two letter names for key number "9".

13. "___" flat and "___" are two letter names for key number "12".

14. "___" sharp and "___" are two letter names for key number "13".

Fig. B3.--Test of Knowledge of Fundamental Concepts of Tonal Organization (Facsimile).

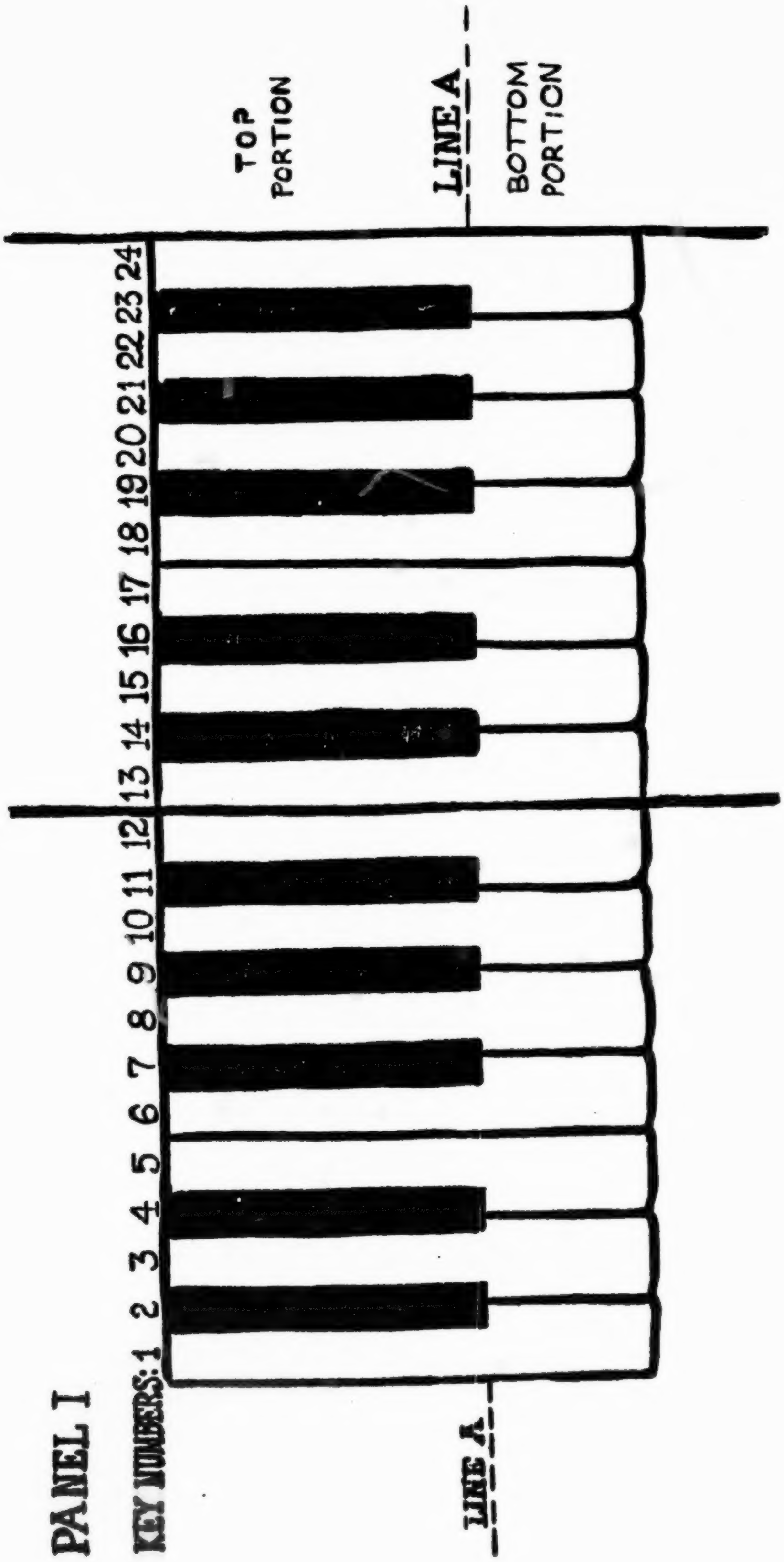

PANEL I
KEY NUMBERS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TOP PORTION
LINE A
BOTTOM PORTION
LINE A

Fig. B4.--Paper keyboard with numbered keys.

pupil, being sure that the keyboard is not folded at Line A. When he is sure that all pupils have both test items, and that the identifying information has been filled in on the test paper, PROCTOR continues.).

"Please give me your attention again. Leave your pencils down. Look at your test paper, on which you have just written your name, grade and room number. There are fourteen problems on the test paper. There are separate directions for the first eleven problems, numbers one through eleven, and for the last three problems, numbers twelve, thirteen, and fourteen. I will read through the entire test with you, giving you instructions as we go along. You will be allowed to do two sample problems, correct them if necessary, and ask questions about the instructions before you actually complete the fourteen problems of the test. Leave your pencils down, and listen carefully."

"Find the words, "DIRECTIONS FOR PROBLEMS 1 THROUGH 11", underlined at the top of the test paper under the words, "KEYBOARD FACTS". Read silently along with me: 'Complete the following using numbers for your answers. The numbers you will use are the key numbers (one through twenty-four) above the black and white keys on Panel One.' Panel One is the name of the paper keyboard each of you has on your desk. Look at that keyboard. Notice the numbers from one through twenty-four across the top of the keyboard. There is one number for each key. Some of the keys are black, and some of the keys are white, but each key has a number from one through twenty-four. Now look at your test paper again. Find the word, 'Sample', underneath the directions we just read, above Problem One on your test paper. Read silently along with me: 'The last black key on the right of the key board is key number BLANK.' To complete the Sample Problem you will have to look at the keyboard chart; find the last black key on the right of the keyboard; and find the number just above that black key. Do not call out your answer. Pick up your pencil, and use it to make the number you have chosen in the BLANK for the Sample Problem."

(PROCTOR allows a moment for the PUPILS to respond to this direction.).

"Now put your pencils down. The correct answer to this Sample Problem is twenty-three."

(PROCTOR holds up his sample paper keyboard so that it faces the class, extending only his left hand index finger over the top of the keyboard so that it points directly down to the number twenty-three. The right hand thumb and index finger grasp the lower left had corner of the keyboard for additional support.).

"If you made the wrong number in the blank for the Sample Problem, erase that number and make twenty-three in its place. If you made twenty-three in the blank, you were correct, and should leave your pencil and eraser down."

(PROCTOR allows a moment for PUPILS to respond to these directions.).

"Leave your pencils down. In the eleven problems that follow the Sample Problem we just did in class, you will always use a key number, from one through twenty-four, for your answer. If you wish, you may use the same number more than once. The key numbers will be placed wherever you find a blank. I will read and explain these eleven problems to you, as you follow reading them silently. Do not complete the blanks as I read and explain; you will be given time to complete the blanks with your pencil later in the period. Leave your pencils down, and just be sure you understand the directions. If you have a question as I go along, please raise your hand, and I will answer it."

"Now find Problem One, under the Sample Problem we did in class. It reads, 'Another white key with the same letter name as key number 'three' is key number BLANK. All the keys on the paper keyboard have letter names, but they are not printed on the paper keyboard. If you do not know the letter names of the keys, you will have to guess your answer; but your guess must be a number from one through twenty-four. If you guess and use zero, or a number higher than twenty-four, or if you leave the BLANK without making a number in it, or if you use a letter instead of a number, your paper will be returned to you before the end of the period so that you can place a number from one to twenty-four as your answer. Another way of stating Problem One would be: 'Find key number three. Another white key that would have the same letter name would be key number BLANK;. Are there any questions now?"

(PROCTOR answers questions, if any, concerning Problem One, and then continues.).

"Now look at Problem Two. It reads: 'Key numbers BLANK and BLANK are both called F double sharp'. You are to find two keys on the paper keyboard that could be called F double sharp, find their key numbers, and make these key numbers with your pencil in the two blanks for Problem Two. Are there any questions about this problem?"

(PROCTOR answers questions, if any, concerning Problem Two, and then continues.).

"Now look at Problem Three. It reads: 'Key numbers BLANK and BLANK are both called B double flat.' You are to find two keys on the paper keyboard that could be called B double flat, find their key numbers, and make these key numbers with your pencil in the two blanks for Problem Three. Are there any questions about this problem?"

(PROCTOR answers questions, if any, concerning Problem Three, and then continues.).

"Now look at Problem Four. It reads: 'Use numbers to show the keys needed to play up three eight-key major scales beginning with the following numbers:'. All of you should know what a major scale is. You have sung up a major scale many times, using the syllables "do", "re", "mi", "fa", "sol", "la", "ti", "do". Now look at the three lines of blanks in Problem Four. Each of the three lines of blanks represents a major scale. Each of the three lines has a starting number, followed by seven blanks. In each of the three lines, the starting number is the key number on the paper keyboard which represents the low "do" of "do-re-mi-fa-sol-la-ti-do". In each of the three lines, the seven blanks that follow the starting number are each to be filled with a key number from the paper keyboard to represent the rest of the scale ("re-mi-fa-sol-la-ti-do"). In other words, the one key number at the beginning of each line plus the seven key numbers that you will make with your pencil in the seven blanks that follow each starting number will show the eight keys needed to play up a major scale. The starting number of the first line is five; of the second line, seven; of the third line, eleven. Are there any questions about Problem Four?"

(PROCTOR answers questions, if any, concerning Problem Four, and then continues.).

"Now look at Problem Five. It reads: 'Choose the other two numbers which will form major triads (three-note chords) in root position above each of the following three numbers:'. A major triad is a three-note chord, formed with three key numbers. The word, 'chord', here refers to a group of three key numbers that represent three keys played at the same time. Now look at the three boxes in Problem Five. Each of the three boxes represents a major triad, or three-note chord. Each of the three boxes has a starting number, followed by two blanks. In each of the three boxes, the starting number is the key number on the paper keyboard which represents the low note of the major triad, or three note chord to be formed. In each of the three boxes, the two blanks that follow the starting number are to be filled with the two key numbers from the paper keyboard that represent the middle and upper notes of the major triad built on the starting number (the number already printed in each box). In other words, the one key number printed in each box plus the two key numbers you will make in the two blanks that follow each starting number will show the three keys needed to form a major triad, or three-note chord, in root position. The starting number of the first box is four; of the second box, nine; of the third box, twelve. Are there any questions about Problem Five?"

(PROCTOR answers questions, if any, concerning Problem Five, and then continues.).

"Now look at Problem Six. It reads: 'Choose the other two numbers which will form minor triads (three-note chords) in root position aobve each of the following three numbers:'. Except for the word, 'minor', this question reads the same as Problem Five, and the instructions are the same for completing this problem as they were for Problem Five. If you do not know the difference between 'major' and 'minor', you will have to guess which key numbers to use. I cannot tell you the difference between 'major' and 'minor', since one of the purposes of this test is to find out if you know what that difference is. Now look at the three boxes in Problem Six. The one key number printed in each box plus the two key numbers you will make in the two blanks that follow each starting number will show the three keys needed to form a minor triad, or three-note chord, in root position. The starting number of the first box is two; of the second box, three; of the third box, eleven. Are there any questions about Problem Six?"

(PROCTOR answers questions, if any, concerning Problem Six, and then continues.).

"Now look at Problem Seven. It reads: 'A whole step higher than key number fifteen is key number BLANK.' You are to locate key number fifteen on the paper keyboard, then find the key number a whole step higher than key number fifteen, and make the key number you found with your pencil in the blank at the end of Problem Seven. If you do not know what a 'whole step' is, you will have to guess. I cannot tell you what it is, since one of the purposes of this test is to find out if you know what it is. Are there any questions about Problem Seven?"

(PROCTOR answers questions, if any, concerning Problem Seven, and then continues.).

"Now look at Problem Eight. It reads: 'A whole step higher than key number seventeen is key number BLANK.' You are to locate key number seventeen on the paper keyboard, then find the key number a whole step higher than key number seventeen, and make the key number you found with your pencil in the blank at the end of Problem Eight. Are there any questions about Problem Eight?"

(PROCTOR answers questions, if any, concerning Problem Eight, and then continues.).

"Now look at Problem Nine. It reads: 'A half step higher than key number eight is key number BLANK.'. You are to locate key number eight on the paper keyboard, then find the key number a half step higher than key number eight, and make the key number you found with your pencil in the blank at the end of Problem Nine. If you do not know what a 'half step' is, you will have to guess. I cannot tell you what it is,since one of the purposes of this test is to find out if you know what it is. However, I must remind you that you may not use the fraction, 'one-half', as part of your answer, since your answer must be one of the key numbers from one through twenty-four. One of the key numbers from one through twenty-four will be the correct answer to Problem Nine. Are there any questions about Problem Nine?"

(PROCTOR answers questions, if any, concerning Problem Nine, and then continues.).

"Now look at Problem Ten. It reads: 'A half step higher than key number eleven is key number BLANK.'. You are to locate key number eleven on the paper keyboard, then find the key number a half step higher than key number eleven, and make the key number you found with your pencil in the blank at the end of Problem Ten. Remember: you may not use the fraction, 'one-half', as part of your answer; only one of the key numbers from one through twenty-four will be the correct answer to Problem Ten. Are there any questions about Problem Ten?"

(PROCTOR answers questions, if any, concerning Problem Ten, and then continues.).

"Now look at Problem Eleven. It reads: 'A half step higher than key number twelve is key number BLANK.'. You are to locate key number twelve on the paper keyboard, then find the key number a half step higher than key number twelve, and make the key number you found with your pencil in the blank at the end of Problem Eleven. Remember: you may not use the fraction, 'one-half', as part of your answer; only one of the key numbers from one through twenty-four will be the correct answer to Problem Eleven. Are there any questions about Problem Eleven?"

(PROCTOR answers questions, if any, concerning Problem Eleven, and then continues.).

"Now find the words, "DIRECTIONS FOR PROBLEMS 12 THROUGH 14" which are underlined just beneath Problem Eleven. Read silently along with me: 'Complete the following using letters (A, B, C, D, E, F, or G) for your answers.' For the last three problems (twelve, thirteen, and fourteen) you are asked to clearly print one of the seven letters (as they appear in the directions we just read) in each of the blanks in these last three problems. If you do not know the letter names of the keys, you will have to guess; but remember, the correct answer will be one of the seven letter names (A, B, C, D, E, F, or G) for these last three problems. If you guess using a letter beyond G (that is, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, or Z) or if you leave the BLANK without making a number in it, or if you use a number instead of a letter, your paper will be returned to you before the end of the period so that you can place a letter (A, B, C, D, E, F, or G) as your answer."

"Now look at the Sample Problem underneath the directions we just read. You will find the word, 'Sample' underlined, just above Problem Twelve. Read silently along with me: 'The first letter in the alphabet is BLANK'. Think of the first letter in the alphabet, but do not call out your answer. Pick up your pencil, and use it to print the letter you have chosen in the BLANK at the end of the Sample Problem."

(PROCTOR allows a moment for the PUPILS to respond to this direction.).

"Now put your pencils down. The correct answer to this Sample Problem is 'A'. If you printed the wrong letter in the BLANK for the Sample Problem, erase that letter and print 'A' in its place. If you printed 'A' in the blank, you were correct, and should leave your pencil down."

(PROCTOR allows a moment for the PUPILS to respond to these directions.).

"Leave your pencils down. In the last three problems that follow this Sample Problem we just did in class, you will always use a letter (A, B, C, D, E, F, or G) for your answer. You should print one of the letters wherever you find a blank. I will read and explain these last three problems to you, as you follow reading them silently. Do not complete the blanks as I read and explain; you will be given time to complete the blanks with your pencil later in the period. Leave your pencils down, and just be sure you understand the directions. If you have a question as I go along, please raise your hand, and I will answer it."

"Now find Problem Twelve, under the Sample Problem we did in class. It reads: 'BLANK flat and BLANK sharp are two letter names for key number nine. You are to find key number nine on the paper keyboard, and think of two letter names it might be given: some letter made flat, and some letter made sharp. Then you will print the two letters you thought of in the two blanks of Problem Twelve. If you wish, you may use the same letter more than once in any of these last three problems, but you must use only the letters A, B, C, D, E, F, or G. Are there any questions about Problem Twelve?"

(PROCTOR answers questions, if any, concerning Problem Twelve, and then continues.).

"Now look at Problem Thirteen. It reads: 'BLANK flat and BLANK are two letter names for key number twelve.' You are to find key number twelve on the paper keyboard, and think of two letter names it might be given: some letter made flat, and some letter (not sharp or flat). Then you will print the two letters you thought of in the two blanks of Problem Thirteen. If you wish, you may use the same letter more than once in any of these last three problems, but you must use only the letters A, B, C, D, E, F, or G. Are there any questions about Problem Thirteen?"

(PROCTOR answers questions, if any, concerning Problem Thirteen, and then continues.).

"Now look at Problem Fourteen. It reads: 'BLANK sharp and BLANK are two letter names for key number thirteen.'. You are to find key number thirteen on the paper keyboard, and think of two letter names it might be given: some letter made sharp and some letter (not sharp or flat). Then you will print the two letters you thought of in the two blanks of Problem Fourteen. If you wish, you may use the same letter more than once in any of these last three problems, but you must use only the letters A, B, C, D, E, F, or G. Are there any questions about Problem Fourteen?"

(PROCTOR answers questions, if any, concerning Problem Fourteen, and then continues.).

"Are there any questions about any of the other problems?"

(PROCTOR answers questions, if any, concerning other problems, and then continues.).

"Leave your pencils down and listen carefully. We are about to begin the test, 'Keyboard Facts'. Remember to refer to the paper keyboard to find the key numbers that are printed, and to find the key numbers you will use as your answers for Problems One through Twelve. For the first twelve problems you are to use only the numbers from one through twenty-four. In the last three problems (twelve, thirteen, and fourteen) you are to print only the letters A, B, C, D, E, F, or G for your answers. When you finish the test, please check your work to be sure that you have used only numbers for problems one through twelve, and letters for problems thirteen, fourteen, and fifteen. Also check to be sure that you filled in all the blanks. When you have finished and checked your work, bring your test paper to me at the front of the room for final checking. If you have a question during the test, raise your hand, and I will come to your desk. Now, pick up your pencil, ready to do all fourteen problems of the 'Keyboard Facts' test. You may begin."

(PROCTOR monitors group, goes to PUPILS' desks to answer questions as, or if, the latter raise their hands, checks finished papers being sure that:

1. All blanks have been filled properly (numbers one through twenty-four for Problems One through Eleven) and letters "A" through "G" for Problems Twelve through Fourteen). If they haven't been, PROCTOR circles in pencil those which are improperly filled, and sends such PUPILS back to their seats to make the necessary corrections. If all blanks have been properly filled, PROCTOR sends such PUPILS back to their seats to wait quietly until the other PUPILS have finished, keeping these papers.

2. All numbers and letters are legible. If they aren't, PROCTOR has such PUPILS that marked illegibly decipher each item in question, and PROCTOR places the correct number or letter as

close as possible to the PUPIL's original response. If all blanks have been properly filled, PROCTOR sends such PUPILS back to their seats to wait quietly until the other PUPILS have finished, keeping these papers.

When the last PUPIL's paper has been received and given a final check as outlined above, PROCTOR continues.).

"Give me your attention, please. This is the end of the 'Keyboard Facts' test."

(PROCTOR gives necessary instructions for class dismissal.).

1. Based on the correct responses to the test (see Fig. B5), a template was designed to aid in correcting the test (see Fig. B6). The circles, squares, and rectangles of this template are to be cut out before the latter is used.

2. Using the template over each test paper, employ a red pencil to make an "X" over any response that is incorrect. Ignore the sample problem responses. In the right hand margin of each test paper, just to the right of each of the twenty problem numbers which appear on the template, employ a red pencil to make a check mark (✓) for those problems which contained no "X" marks. Thus, the check marks will indicate those problems which were completely correct. The attention of the scorer is called to the fact that in order to be completely correct, all seven response blanks of Problems 4, 5, and 6 must be "X"-free; so must both response blanks of Problems 2, 3, 7, 8, 9, 10, 11, 12, 18, 19, 20; so must the single response blanks of the remaining problems.

3. The total of the number of check marks in the right hand margin equals the "No. Right". Consult the Scoring Table (see Table IV) for "Percentage Score". The "No. Right" with the "Percentage Score" just beneath is to be recorded in the upper right hand corner of each test paper.

---

This experimenter also entered the following information on each test paper:

1. The date of the test.

2. A test identification number. A number was assigned each test paper, numbering from the highest score in the lowest grade level to the lowest score in the highest grade level.

(The percentage score and Item 2 above were entered on each pupil's Data Sheet.).

FULL NAME________________________________________GRADE_______ROOM_______

## KEYBOARD FACTS

DIRECTIONS FOR PROBLEMS 1 THROUGH 11: Complete the following using numbers for your answers. The numbers you will use are the key numbers ("1" through "24") above the black and white keys on Panel I.

Sample: The last black key on the right of the keyboard is key number "23".

1. Another white key with the same letter name as key number "3" is key number "15".

2. Key numbers "8" and "20" are both called "F double sharp".
(OR "20") (OR "8")

3. Key numbers "10" and "22" are both called "B double flat".
(OR "22") (OR "10")

4. Use numbers to show the keys needed to play up three 8-key major scales beginning with the following numbers:

"5", "7", "9", "10", "12", "14", "16", "17".

"7", "9", "11", "12", "14", "16", "18", "19".

"11", "13", "15", "16", "18", "20", "22", "23".

5. Choose the other two numbers which will form major triads (3-note chords) in root position above each of the following three numbers:

"4", "8", "11" | "9", "13", "16" | "12", "16", "19"

6. Choose the other two numbers which will form minor triads (3-note chords) in root position above each of the following three numbers:

"2", "5", "9" | "3", "6", "10" | "11", "14", "18"

7. A whole step higher than key number "15" is key number "17".

8. A whole step higher than key number "17" is key number "19".

9. A half step higher than key number "8" is key number "9"

10. A half step higher than key number "11" is key number "12".

11. A half step higher than key number "12" is key number "13".

DIRECTIONS FOR PROBLEMS 12 THROUGH 14: Complete the following using letters (A, B, C, D, E, F, or G) for your answers.

Sample: The first letter in the alphabet is "A".

12. "A" flat and "G" sharp are two letter names for key number "9".

13. "C" flat and "B" are two letter names for key number "12".

14. "B" sharp and "C" are two letter names for key number "13".

Fig. B5.--Test of Knowledge of Fundamental Concepts of Tonal Organization (Facsimile marked showing correct responses).

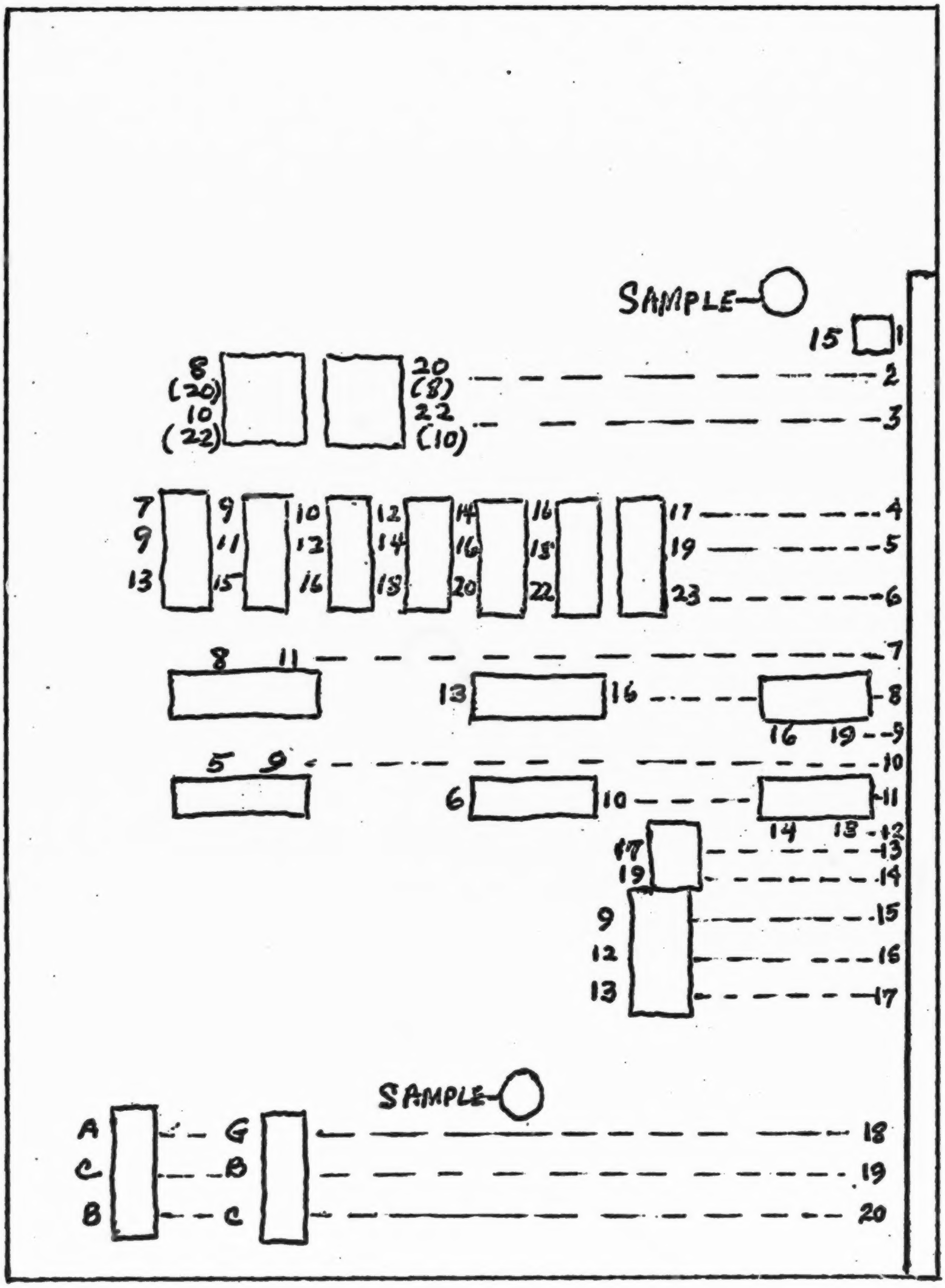

SAMPLE
15
1
8
(20)
10
(22)
20
(8)
22
(10)
2
3
7
9
13
9
11
15
10
12
16
12
14
18
14
16
20
16
18
22
17
19
23
4
5
6
8
11
7
13
16
8
16
19
9
5
9
10
6
10
11
14
18
12
17
19
13
14
9
12
13
15
16
17
SAMPLE
A
C
B
G
B
C
18
19
20

Fig. B6.--Test of Knowledge of Fundamental Concepts of Tonal Organization Scoring Template.

## TABLE IV

## TEST OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION SCORING TABLE

| No. Wrong | Percentage Score | No. Right |
|---|---|---|
| 0 | 100 | 20 |
| 1 | 95 | 19 |
| 2 | 90 | 18 |
| 3 | 85 | 17 |
| 4 | 80 | 16 |
| 5 | 75 | 15 |
| 6 | 70 | 14 |
| 7 | 65 | 13 |
| 8 | 60 | 12 |
| 9 | 55 | 11 |
| 10 | 50 | 10 |
| 11 | 45 | 9 |
| 12 | 40 | 8 |
| 13 | 35 | 7 |
| 14 | 30 | 6 |
| 15 | 25 | 5 |
| 16 | 20 | 4 |
| 17 | 15 | 3 |
| 18 | 10 | 2 |
| 19 | 5 | 1 |
| 20 | 0 | 0 |

Note: "No. Right" used for ranking purposes.

# APPENDIX C. TEST OF RHYTHMIC DISCRIMINATION

## A. Pilot Test of Rhythmic Discrimination

The Pilot Test of Rhythmic Discrimination, along with the pilot tests in the other four areas of this experiment, was administered as a closing activity in June 1964 to all fourth, fifth, and sixth grade pupils in the experimental school. (This experimenter was not assigned the control school until September 1964; hence control school pupils were not included in the pilot test.) Before the June 1964 tests none of the experimental procedures were taught to the pupils involved in the experiment. All pupils were on summer vacation after that date, and there is no evidence to show that they received any training during the vacation period.

The Pre Test of Rhythmic Discrimination, along with the pre tests in the other four areas of this experiment, was administered as an opening activity to all fourth, fifth, and sixth grade pupils in both experimental and control schools, when school resumed in September 1964.

The Pilot Test of Rhythmic Discrimination was not revised; its form is identical to the Pre Test of Rhythmic Discrimination (used for Post and Terminal Tests as well).

## B. Reliability of the Test of Rhythmic Discrimination

Because the same form of the Test of Rhythmic Discrimination was used for both pilot and pre tests, it was feasible to use a Spearman Rank Correlation Coefficient ($r_s$) to relate pilot and pre tests given to fourth, fifth, and sixth grade pupils in the experimental school who received both Pilot and Pre Tests of Rhythmic Discrimination.

The Spearman Rank Correlation Coefficient formula which was used (15) included the correction for ties. Since the subjects constituted a random sample, one may test whether the observed value of $r_s$ indicates an association between the pilot and pre tests by using a formula for $\underline{t}$ (15). Having computed the $\underline{t}$ associated with the observed value of $r_s$, the significance of that value of $\underline{t}$ can be found in a table of critical values of $\underline{t}$ (15).

The Spearman Rank Correlation Coefficients and their significance for the Pilot and Pre Tests of Rhythmic Discrimination appear in tabular form in Table V on page C-3. It will be noted that the correlation coefficient for the Fourth Grade is a negative coefficient. It is felt that the guess factor contributed to this low reliability coefficient. Despite this low reliability coefficient, the median scores for pilot and pre test were more equal in the Fourth Grade tests than they were at any other grade level.

All of the other correlation coefficients are significant at the .05 level or less.

## TABLE V

## TEST OF RHYTHMIC DISCRIMINATION PILOT AND PRE TESTS COMPARED: THE SIGNIFICANCE OF SPEARMAN RANK CORRELATION COEFFICIENTS ($r_s$) IN INDICATING AN ASSOCIATION BETWEEN THEM

| Group | N | $r_s$ | $t$ | Level of Significance | | Medians[a] (Perfect Score=100) | | Ranges of Scores | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Less Than | Greater Than | Pilot Test | Pre Test | Pilot Test | Pre Test |
| Grade 4 | 45 | -.0428 | . . .[b] | . . .[b] | .10 | 24.1 | 25.2 | 0-60 | 0-70 |
| Grade 5 | 40 | +.3138 | 2.008 | .05 | .025 | 23.8 | 34.3 | 0-70 | 0-80 |
| Grade 6 | 56 | +.2934 | 2.224 | .025 | .01 | 39.8 | 50.1 | 0-80 | 10-90 |
| Grades 4, 5, and 6 Combined.. | 141 | +.2884 | 3.608 | .0005 | . .[c] | 30.3 | 33.9 | 0-80 | 0-90 |

[a] Based on Scores ("Percentage Score") for Test of Rhythmic Discrimination.

[b] Because $r_s$ in this instance was a negative coefficient, the critical value of $t$ has not been included, and since its level of significance would be much greater than .10, such a $t$ does not appear on standard tables.

[c] Not available from standard tables; when df = more than 120 to infinity, $t$ = 3.291 at .0005 level of significance. In this case df (i.e., N-2) = 139.

## C. Instructions for Administering Test of Rhythmic Discrimination

### 1. PREPARATION

Materials Needed for Each Pupil

Chair;
Writing surface to accomodate two 8½ x 11 papers side by side, with the base of the paper on the pupil's left being 11 inches, and of that on the right, 8½ inches. (Be sure that the surface of the desk or table used allows sufficient space to accomodate the above measurements.);
Two sharpened pencils (erasers not required);
Two-page stapled (in the upper left-hand corner) problem sheet entitled "Problem Sheet...Matching Notes to Rhythms" (purple "Ditto ink) placed face down (see Figs. C17 and C18);
One-page answer sheet entitled "Answer Sheet...Matching Notes to Rhythms" (black "Mimeograph" ink) placed face up (see Fig. C19).

Materials Needed for the Proctor

Bulletin board or blackboard space for posting previously prepared visual aids (see Fig. C1) and thumb tacks if the former is used;
Masking tape for affixing visual aids to each other, and for mounting master aid if blackboard space is used;
Table for tape recorder and visual aids (if a chalk tray is available it is ideal for the additional visual aids needed);
Tape recorder which will play at 7½ ips;
Tape recording entitled "Matching Notes to Rhythms" (recorded at 7½ ips);
Large pointer for proctor to use in pointing to visual aids;
Sign to be affixed face outward to door of room: "TESTING. PLEASE DO NO KNOCK OR ENTER".

### 2. PROCEDURE

Allow forty minutes for the administration of this test. This time period includes provision for seating the pupils, distributing test papers, playing the test tape with only the one stop described in the text below (allowing time for extensive questioning by the pupils), collecting the test papers, and dismissing the pupils. The running time of the test tape, without

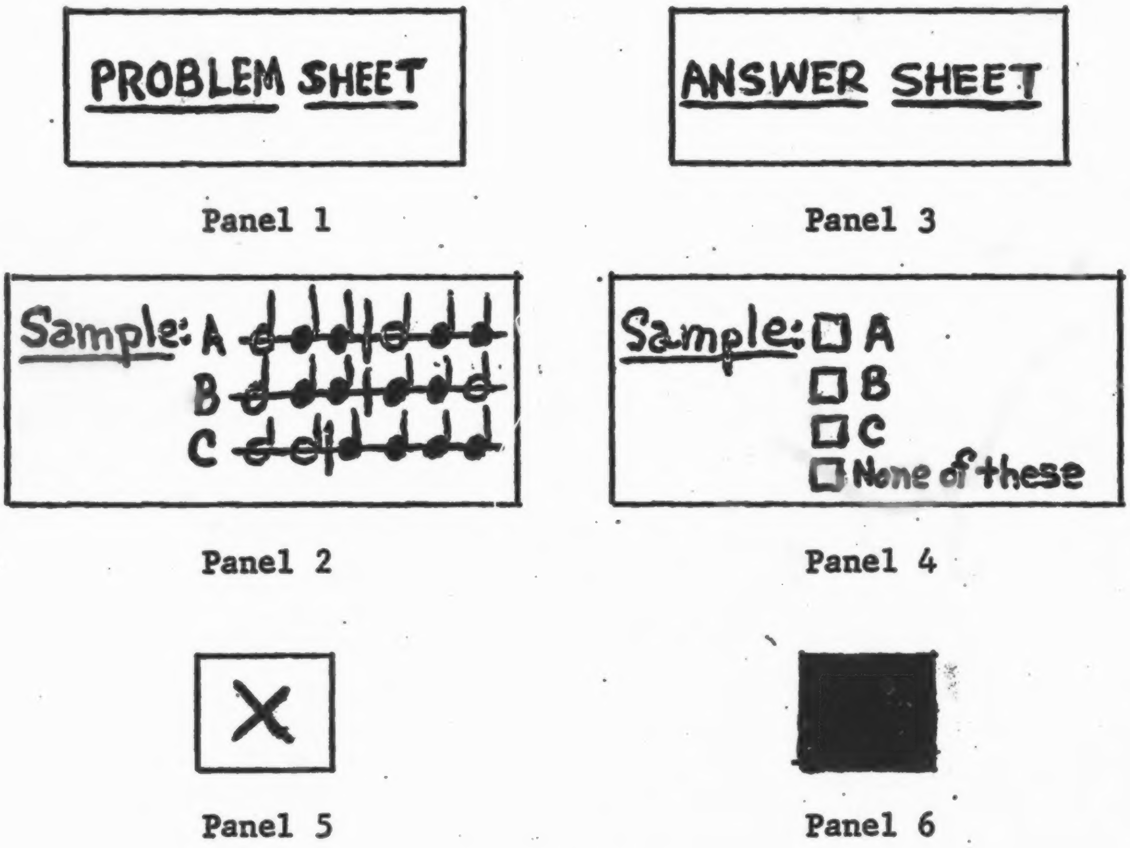


Fig. C1.--Test of Rhythmic Discrimination visual aids.

(For an explanation of the construction of these visual aids, see "Explanation of Fig. C1." appearing below.)

Explanation of Fig. C1. All panels were made from white poster board. Panels 1 and 2 were drawn with purple crayon; Panels 3 through 6 were inked with black "Speedry" ink. Panels 1 through 4 should be made large enough for the pupils to see clearly from any point in the testing room. The author made Panels 1 and 3, 22" x 8"; Panel 2, 28" x 12½"; Panel 4, 22" x 16"; Panels 5 and 6, 2" x 2". Panel 1 is to be placed above Panel 2; Panel 3 is to be placed above Panel 4, with Panels 3 and 4 to the right of Panels 1 and 2 (see positioning of Panels 1 through 4 as shown above in Fig. C1). The four squares on Panel 4 should match the dimensions of Panels 5 and 6. Small lengths of masking tape rolled between the thumb and forefinger with the adhesive side out can be employed to affix Panels 1 through 4 to the blackboard, and Panels 5 and 6 to Panel 4 as directed in the instructions for the test.

stop, is 33 min. 4 secs.

As soon as the pupils are seated and quiet, the PROCTOR chooses a pupil (or pupils) to distribute test answer sheets face up. Then PROCTOR states: "While you are getting your test papers, I am going to place some other papers face down on your desk. Do not turn over the papers I place on your desk until I tell you to do so." PROCTOR places test problem sheets face down to the left of the answer sheets. When both test answer and problem sheets have been distributed, PROCTOR states: "Please use your pencil now to fill in the information at the top of the paper. When you have finished, put your pencil down. Please print or write your full name (that is, your first name, middle initial or name, and last name), your room:(PROCTOR announces number of pupils' home-room), and your grade in school." PROCTOR STARTS TEST TAPE, when PUPILS are ready to begin.

### 3. TEXT OF THE TAPE

Give me your attention, please. Pencils down. Listen carefully. This is the test called, "Matching Notes to Rhythms".

This test will show your ability to match notes that you see to rhythms that you hear.

In the rhythms you will hear, only this tone:...

*

PIANO

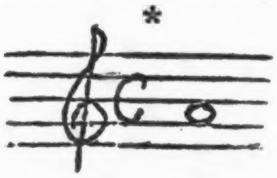


Fig. C2

...will be played six times, with some of the tones shorter and some longer.

For example, the six-tone rhythm could sound like this:

(PROCTOR counts up to six on his fingers for the class to see, as each of the six tones is sounded, pointing to the tips of five fingers of his left hand with his right-hand forefinger, with the palm of the left hand toward the proctor, and then holding up his right-hand forefinger just to the right of his left hand).

---

* Figs. C2 through C10 at MM♩=92, except Fig. C8 at MM♪ = 92

PIANO

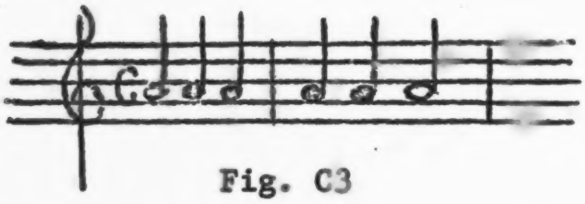


Fig. C3

Another six-tone rhythm could sound like this:

(PROCTOR repeats counting process as explained above Fig. C3.).

PIANO

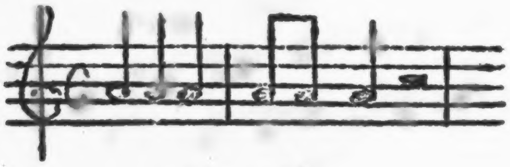


Fig. C4

Every time you hear a six-tone rhythm you are to watch your test paper. For each six-tone rhythm you hear you will have to choose the line of six notes that matches it. There will be three lines of six notes from which to choose for each six-tone rhythm you hear.

(PROCTOR moves with pointer to right of Panels 1 and 2 of Fig. C1.).

Your teacher will now do a sample problem at the board.

(PROCTOR quickly states: "Watch the board.").

Notice the three lines of notes marked "A", "B", and "C".

(PROCTOR moves pointer from left to right along lines A, B, and C of Panel 2 of Fig. C1.).

Lines A, B, and C each have six notes,...

(PROCTOR points to each of the eighteen notes of Panel 2 of Fig. C1 as the text continues.).

...but only one line will match the rhythm the piano will play. You are to choose the one line of notes that matches the rhythm the piano will play. To help you choose, the piano will play the rhythm five times. Be sure not to call out your answer, or in any way show when you have found the matching line. The first time, listen carefully with your eyes closed. Close your eyes now and listen:

PIANO

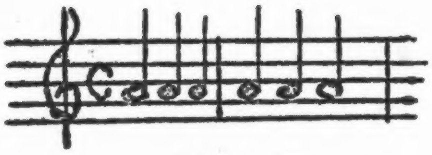


Fig. C5

Now open your eyes and find the notes of Line A.

(PROCTOR points to the six notes of Line A of Panel 2 of Fig. Cl.).

Follow the notes of Line A, pointing with your finger, to see if they match the rhythm:

(PROCTOR points to notes of Line A of Panel 2 of Fig. Cl as they are played using the pointer in the right hand to touch each note, and, pointing to the same notes with the left hand forefinger, with the arm held straight, to indicate that the pupils must also point to each note, states: "Everybody, point with me." ).

(PIANO plays as in Fig.C5.).

Now follow the notes of Line B, pointing with your finger to see if they match the rhythm:

(PROCTOR points to notes of Line B of Panel 2 of Fig. Cl as they are played, following the same procedure just followed for Line A.).

(PIANO plays as in Fig. C5.).

Now follow the notes of Line C, pointing with your finger to see if they match the rhythm:

(PROCTOR points to notes of Line C of Panel 2 of Fig. Cl as they are played, following the same procedure followed for Lines A and B.).

(PIANO plays as in Fig. C5.).

By now you should have chosen the line of notes that matches the rhythm; either Line A, or Line B, or Line C.

(PROCTOR quickly points from left to right on each line as "A", "B", and "C" are mentioned.).

Follow the line you chose, to make sure the rhythm matches.

(PIANO plays as in Fig. C5.).

Remember the letter of the line you chose.

(PROCTOR moves to the right of Panels 3 and 4 of Fig. Cl.).

Look now at the sample Answer Sheet on the board.

(PROCTOR points to Panel 4 of Fig. Cl.).

Notice the boxes to the left of the letters A, B, C, and the words, "None of these".

(PROCTOR points to each of the four boxes on Panel 4 of Fig. Cl as they are named, and holds Panel ready for use.).

If you thought Line A seemed to match the rhythm played, you will make an "X" in the box to the left of the letter, "A".

(PROCTOR affixes Panel 5 of Fig. Cl to cover the box of Line A on Panel 4 of Fig. Cl, removing it as the text resumes.).

If you thought Line B seemed to match the rhythm played, you will make an "X" in the box to the left of the letter, "B".

(PROCTOR affixes Panel 5 of Fig. Cl to cover the box of Line B on Panel 4 of Fig. Cl, removing it as the text resumes.).

If you thought Line C seemed to match the rhythm played, you will make an "X" in the box to the left of the letter, "C".

(PROCTOR affixes Panel 5 of Fig. Cl to cover the box of Line C on Panel 4 of Fig. Cl, removing it as the text resumes.).

However, if you thought none of these three lines of notes seemed to match the rhythm played, you will make an "X" in the box to the left of the words, "None of these".

(PROCTOR affixes Panel 5 of Fig. Cl to cover the box of the line marked "None of these" on Panel 4 of Fig. Cl, and holds Panel 6 ready for use.).

If you make a mistake, do not bother to erase. Just blacken the box you did not want marked...

(PROCTOR quickly removes Panel 5 of Fig. Cl and replaces it with Panel 6 of Fig. Cl.).

...and make an "X" in the box you do want marked.

(PROCTOR in quick succession holds Panel 5 over each of the four boxes of Panel 4 of Fig. C1, at the same time saying, "A, or B, or C, or None of these.").

Now, turn over the papers which were face down on your desk.

(The tape here includes a pause of four seconds.).

Notice there are two pages stapled together with purple printing: Problem Sheet No. 1 and Problem Sheet No. 2. You will find the sample problem we did at the board is also shown on Problem Sheet No. 1 at the top of the page above the line of dashes where you find the word, "Sample". Leave your pencils down. We will repeat the sample problem on your problem sheet.

Notice the three lines of notes marked, "A", "B", and "C".

Lines A, B, and C each have six notes, but only one line will match the rhythm the piano will play. You are to choose the one line of notes that matches the rhythm the piano will play. To help you choose, the piano will play the rhythm five times. Be sure not to call out your answer, or in any way show when you have found the matching line. The first time, listen carefully with your eyes closed. Close your eyes now and listen:

PIANO

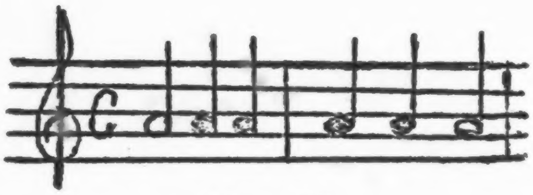


Fig. C6

Now open your eyes and find the notes of Line A. Follow the notes of Line A, pointing with your finger, to see if they match the rhythm:

(PIANO plays as in Fig. C6.).

Now follow the notes of Line B, pointing with your finger to see if they match the rhythm :

(PIANO plays as in Fig. C6.).

Now follow the notes of Line C, pointing with your finger to see if they match the rhythm:

(PIANO plays as in Fig. C6.).

By now you should have chosen the line of notes that matches the rhythm; either Line A, or Line B, or Line C. Follow the line you chose, to make sure the rhythm matches:

(PIANO plays as in Fig. C6.).

Remember the letter of the line you chose.

Now look at the answer sheet---the sheet with the black printing---the sheet that has your name, room, and grade. Find the word, "Sample", above the line of dashes.

Notice the boxes to the left of the letters A, B, C, and the words, "None of these". Leave your pencils down.

If you thought Line A seemed to match the rhythm played, you will make an "X" in the box to the left of the letter, "A".

If you thought Line B seemed to match the rhythm played, you will make an "X" in the box to the left of the letter, "B".

If you thought Line C seemed to match the rhythm played, you will make an "X" in the box to the left of the letter, "C".

However, if you thought none of these three lines of notes seemed to match the rhythm played, you will make an "X" in the box to the left of the words, "None of these".

If you make a mistake, do not bother to erase. Just blacken the box you did not want marked and make an "X" in the box you do want marked.

Now, pick up your pencil and mark one of the four boxes in the sample problem. If you're not sure, guess.

(The tape here includes a pause of six seconds.).

Pencils down.

(PROCTOR moves to the right of Panels 3 and 4 of Fig. C1, removing Panels 5 and 6 from Panel 4 of Fig. C1.).

The correct answer to the sample problem is "B".

(PROCTOR affixes Panel 5 to cover the box to the left of the letter, "B",on Panel 4 of Fig. C1.).

You should have marked the box to the left of the letter, "B". If there are any questions now, ask your teacher.

(PROCTOR STOPS THE TEST TAPE and answers the PUPILS' questions, using the sample problem and the visual aids if necessary to clarify the instructions. The tape includes a three second pause after the last words of the text, "...your teacher", and those that follow, "In the...". When the PUPILS' questions have been answered, START THE TEST TAPE AGAIN.).

In the ten problems that follow, remember not to show your neighbor when you have found the matching line. Cover your paper so that others cannot see you marking it. Remember to listen the first time with your eyes closed. Remember to watch the lines of notes carefully the other four times, pointing to the notes with your fingers.

Now look at the Problem Sheet No. 1---the sheet with the notes, not the boxes. Find the number "1" problem under the line of dashes. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

PIANO

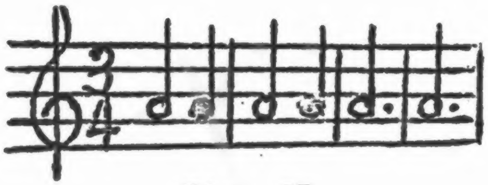


Fig. C7

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C7.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C7.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C7.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C7.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "1". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these".

Pick up your pencil, and mark your answer to number "1".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "2" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

MM ♪ = 92

PIANO

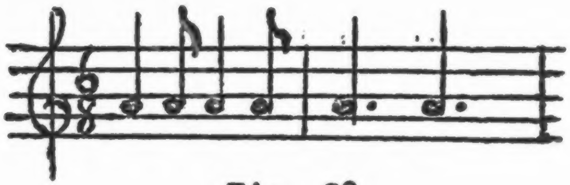


Fig. C8

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C8.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C8.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C8.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C8.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "2". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "2".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "3" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

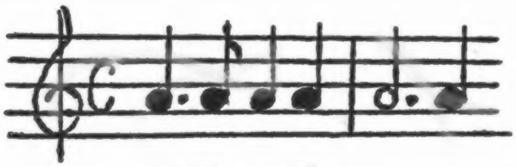
**PIANO** 

Fig. C9

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C9.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C9.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C9.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C9.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "3". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "3".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "4" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

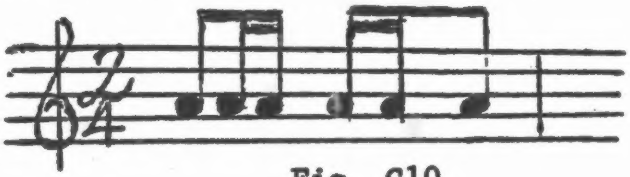
**PIANO** 

Fig. C10

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C10.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C10.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C10.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C10.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "4". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "4".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "5" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

PIANO

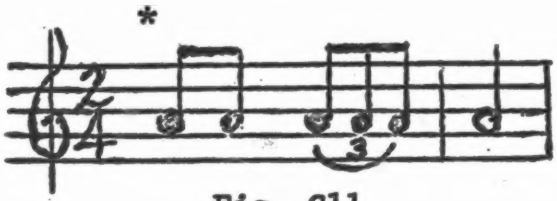


Fig. C11

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C11.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C11.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C11.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

---

* Figs. C11 through C16 at MM = 72

(PIANO plays as in Fig. C11.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "5". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "5".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "6" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

PIANO

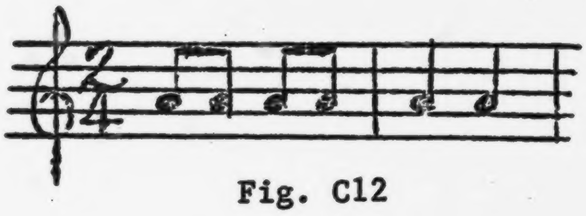


Fig. C12

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C12.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C12.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C12.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C12.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "6". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "6".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. We have finished Problem Sheet No. 1. Please turn the page so that you can now see Problem Sheet No. 2. Turn the page.

(The tape here includes a pause of five seconds.).

At the top of the page you will find problem number "7". You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

PIANO

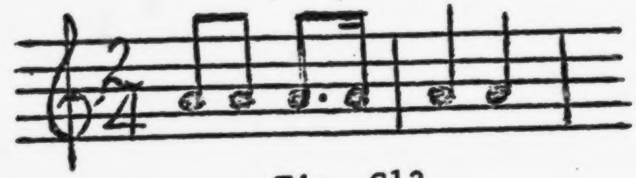


Fig. C13

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C13.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C13.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C13.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C13.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "7". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "7".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "8" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

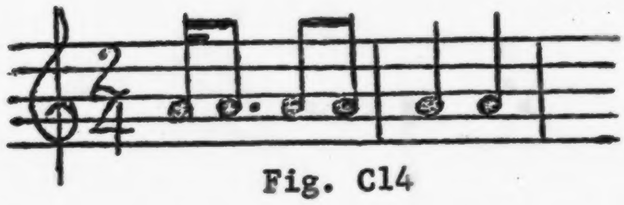
PIANO 

Fig. C14

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C14.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C14.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C14.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C14.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "8". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "8".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "9" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

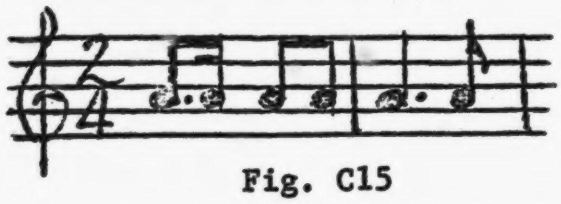
PIANO 

Fig. C15

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C15.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C15.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C15.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

(PIANO plays as in Fig. C15.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "9". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "9".

(The tape here includes a pause of ten seconds.).

Pencils down. Now look at the problem sheet---the sheet with the notes, not the boxes. Find the number "10" problem. You will find three lines of notes marked, "A", "B", "C". One of these lines, or maybe none of these lines, will match the rhythm you will hear. Close your eyes and listen:

PIANO

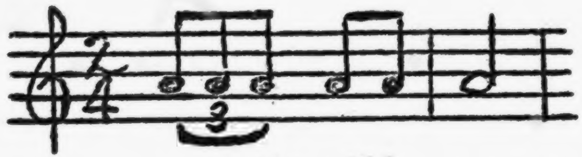


Fig. C16

Open your eyes. See if Line A matches this rhythm:

(PIANO plays as in Fig. C16.).

Now see if Line B matches this rhythm:

(PIANO plays as in Fig. C16.).

Now see if Line C matches this rhythm:

(PIANO plays as in Fig. C16.).

As I play the rhythm for the last time, watch either Line A, or B, or C---whichever you think matches the rhythm I played:

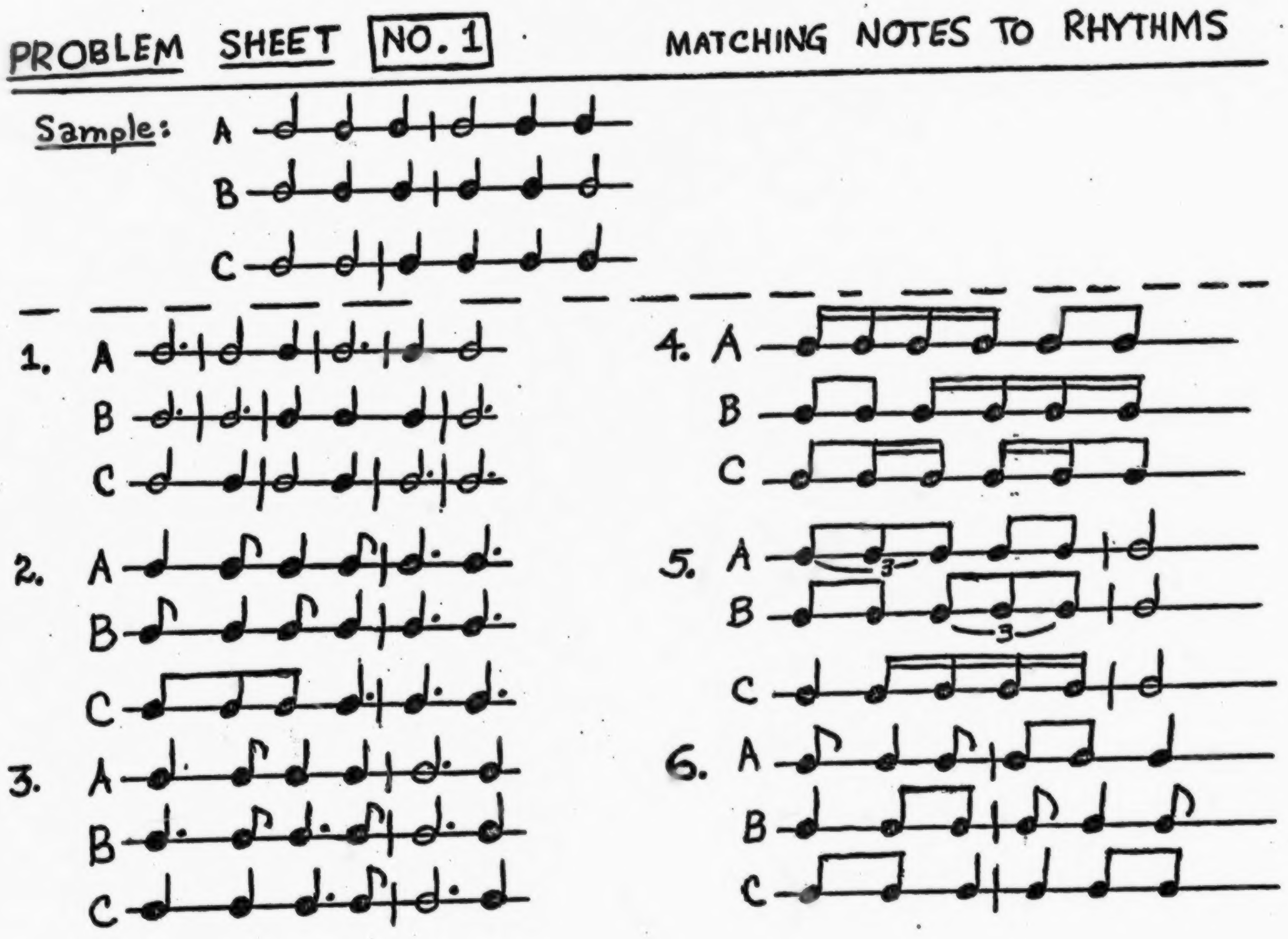
(PIANO plays as in Fig. C16.).

Now look at the answer sheet---the sheet with the boxes, not the notes. Find the number "10". When I tell you to, pick up your pencil. Make an "X" inside the box to the left of "A", or "B", or "C". Or if you think it was none of the three lines, make an "X" in the box to the left of the words, "None of these". Pick up your pencil, and mark your answer to number "10".

(The tape here includes a pause of ten seconds.).

Pencils down. This is the end of the "Matching Notes to Rhythms" test. Listen to your teacher for further instructions.

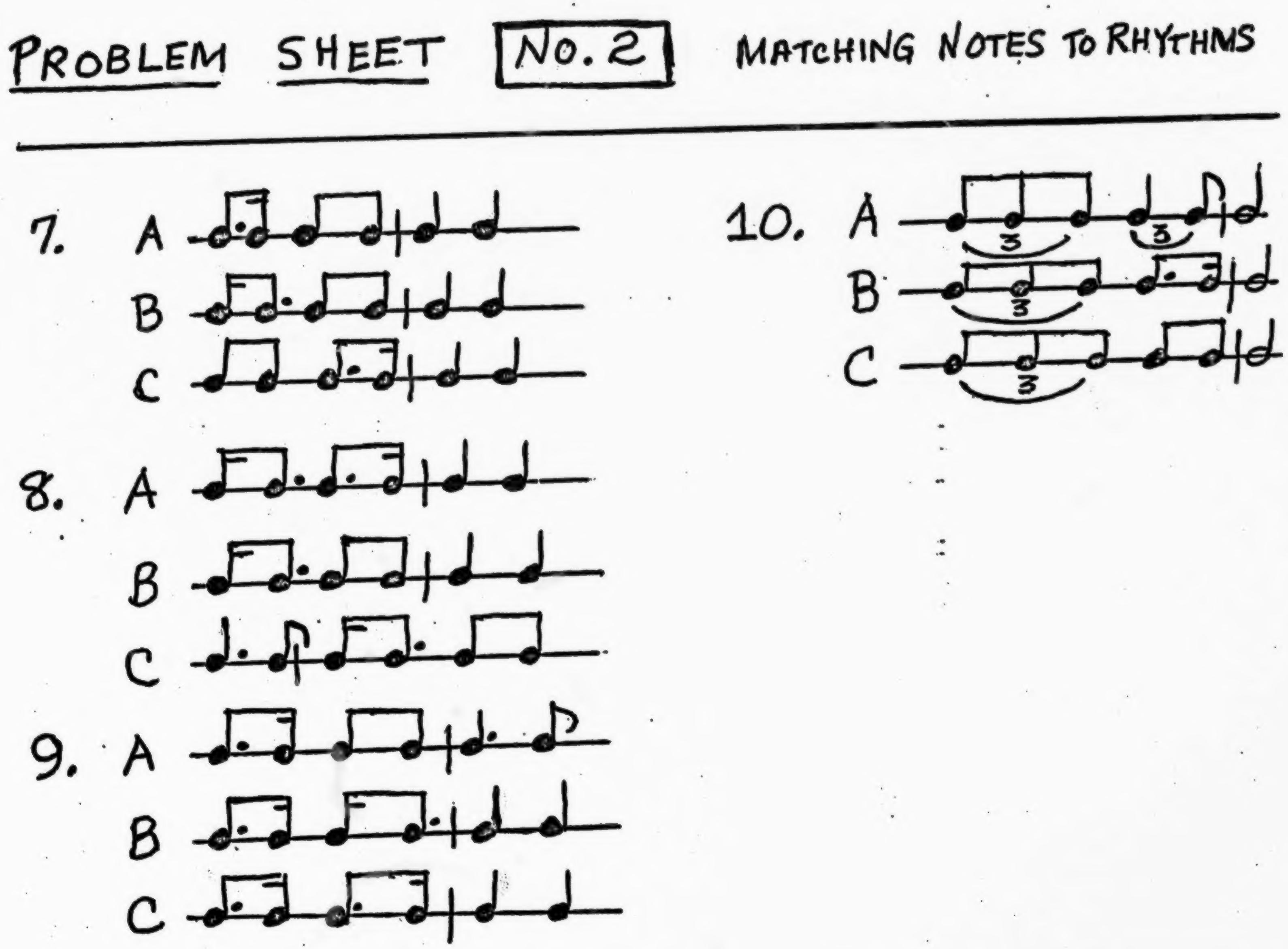
(PROCTOR gives necessary instructions for collecting papers and for class dismissal.).



PROBLEM SHEET NO. 1 MATCHING NOTES TO RHYTHMS

Sample:
A
B
C
1.
A
B
C
2.
A
B
C
3.
A
B
C
4.
A
B
C
5.
A
3
B
3
C
6.
A
B
C

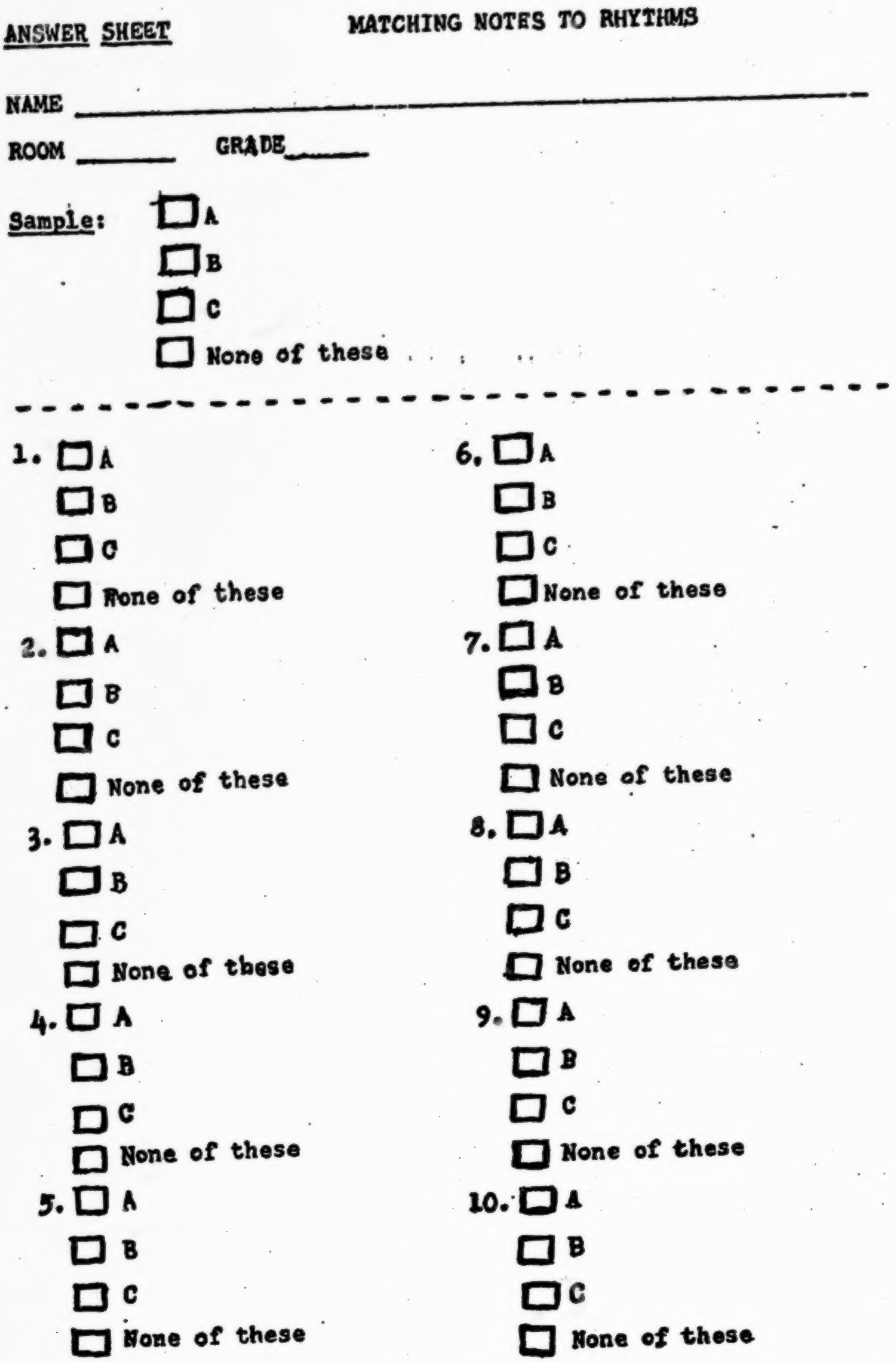
Fig. C17.--Test of Rhythmic Discrimination Problem Sheet No. 1 (Facsimile).



PROBLEM SHEET No. 2 MATCHING NOTES TO RHYTHMS

7. A
B
C
8. A
B
C
9. A
B
C
10. A
B
C
3

Fig. C18.--Test of Rhythmic Discrimination Problem Sheet No. 2 (Facsimile).



ANSWER SHEET MATCHING NOTES TO RHYTHMS

NAME ______________________________

ROOM ______ GRADE______

Sample: ☐ A
☐ B
☐ C
☐ None of these

- - - - - - - - - - - - - - - - - - - - - - - -

1. ☐ A
☐ B
☐ C
☐ None of these

2. ☐ A
☐ B
☐ C
☐ None of these

3. ☐ A
☐ B
☐ C
☐ None of these

4. ☐ A
☐ B
☐ C
☐ None of these

5. ☐ A
☐ B
☐ C
☐ None of these

6. ☐ A
☐ B
☐ C
☐ None of these

7. ☐ A
☐ B
☐ C
☐ None of these

8. ☐ A
☐ B
☐ C
☐ None of these

9. ☐ A
☐ B
☐ C
☐ None of these

10. ☐ A
☐ B
☐ C
☐ None of these

Fig. C19.--Test of Rhythmic Discrimination Answer Sheet (Facsimile).

## D. Instructions for Scoring Test of Rhythmic Discrimination

1. Based on the correct responses to the test (see Fig.C20), a template was designed to aid in correcting the test (see Fig.C21). Both rectangles of this template are to be cut out before the latter is used.

2. Using the template over each test paper, employ a red pencil to make a check mark (✓) just to the left of the correct response box for each problem if the testee marked that response box with a pencilled "X". No problem can be considered correct if two or more boxes in the same problem were marked with an "X" by the testee. Response boxes blackened by the testee are to be ignored. Thus, if the testee blackened the response box which would have been the correct response box for the problem, the scorer must not make a check mark.

3. The total of the number of check marks made by the scorer on the test paper equals the "No. Right". Consult the Scoring Table (see Table VI) for "Percentage Score". The "No. Right" with the "Percentage Score" just beneath is to be recorded in the upper right hand corner of each test paper.

---

This experimenter also entered the following information on each test paper:

1. The date of the test.

2. A test identification number. A number was assigned each test paper, numbering from the highest score in the lowest grade level to the lowest score in the highest grade level.

(The percentage score and Item 2 above were entered on each pupil's Data Sheet.).

**ANSWER SHEET** MATCHING NOTES TO RHYTHMS

NAME ____________________________________________

ROOM _______ GRADE______

**Sample:**
☐ A
☐ B
☐ C
☐ None of these

- - - - - - - - - - - - - - - - - - - - - - - - - - - - -

1. ☐ A
☐ B
☐ C
☐ None of these

2. ☐ A
☐ B
☐ C
☐ None of these

3. ☐ A
☐ B
☐ C
☐ None of these

4. ☐ A
☐ B
☐ C
☐ None of these

5. ☐ A
☐ B
☐ C
☐ None of these

6. ☐ A
☐ B
☐ C
☐ None of these

7. ☐ A
☐ B
☐ C
☐ None of these

8. ☐ A
☐ B
☐ C
☐ None of these

9. ☐ A
☐ B
☐ C
☐ None of these

10. ☐ A
☐ B
☐ C
☐ None of these

Fig. C20.--Test of Rhythmic Discrimination Answer Sheet (Facsimile marked showing correct responses).

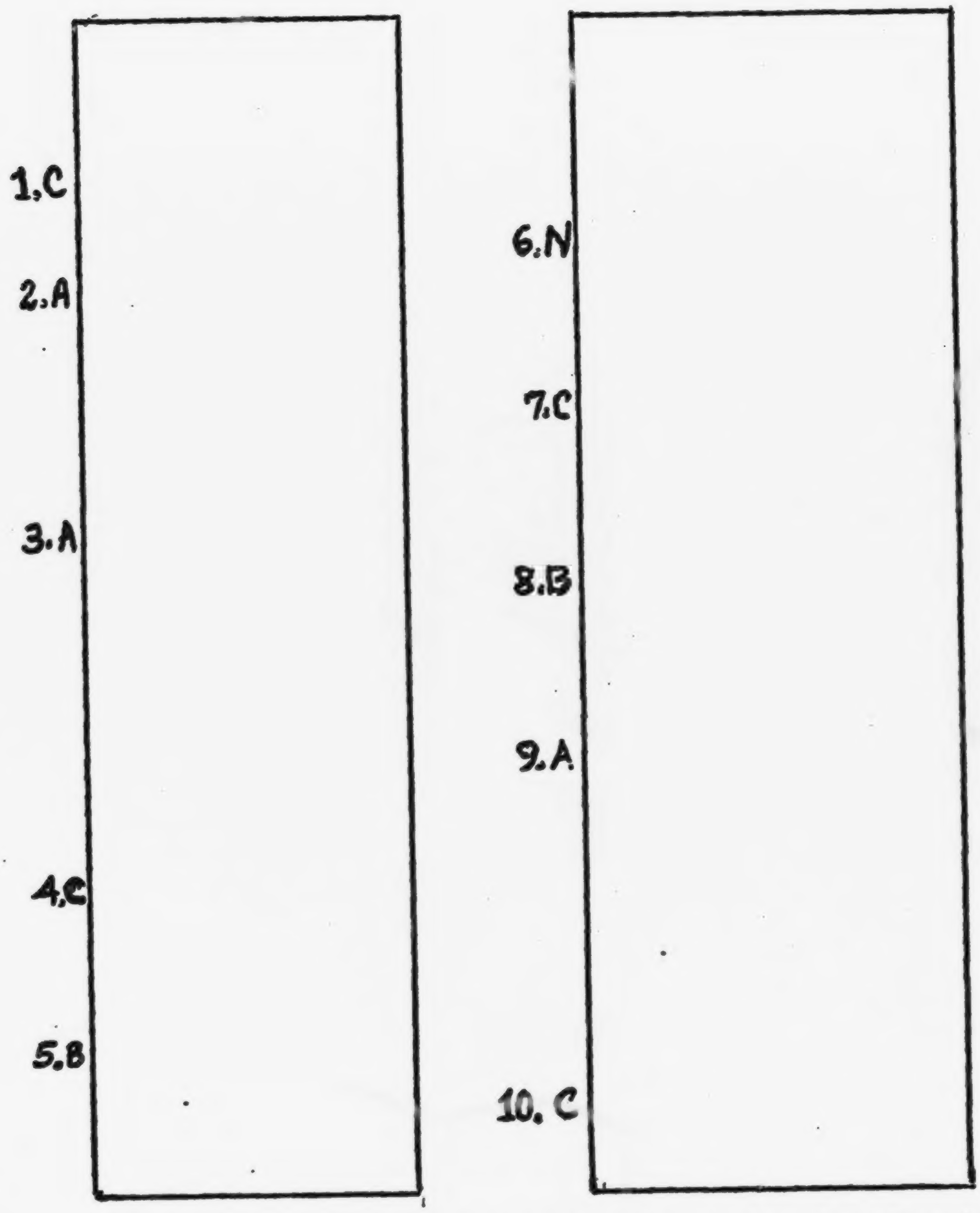

1,C
2,A
3.A
4,C
5,B
6,N
7,C
8,B
9.A
10, C

Fig. C21.--Test of Rhythmic Discrimination Scoring Template

## TABLE VI

### TEST OF RHYTHMIC DISCRIMINATION SCORING TABLE

| No. Wrong | Percentage Score | No. Right |
|---|---|---|
| 0 | 100 | 10 |
| 1 | 90 | 9 |
| 2 | 80 | 8 |
| 3 | 70 | 7 |
| 4 | 60 | 6 |
| 5 | 50 | 5 |
| 6 | 40 | 4 |
| 7 | 30 | 3 |
| 8 | 20 | 2 |
| 9 | 10 | 1 |
| 10 | 0 | 0 |

Note: "No. Right used for ranking purposes.

# APPENDIX D. TEST OF INTERVAL RECOGNITION

## A. Pilot Test of Interval Recognition

The Pilot Test of Interval Recognition, along with the pilot tests in the other four areas of this experiment, was administered as a closing activity in June 1964 to all fourth, fifth, and sixth grade pupils in the experimental school. (This experimenter was not assigned the control school until September 1964; hence control school pupils were not included in the pilot test.) Before the June 1964 tests none of the experimental procedures were taught to the pupils involved in the experiment. All pupils were on summer vacation after that date, and there is no evidence to show that they received any training during the vacation period.

The Pre Test of Interval Recognition, along with the pre tests in the other four areas of this experiment, was administered as an opening activity to all fourth, fifth, and sixth grade pupils in both experimental and control schools, when school resumed in September 1964.

The Pilot Test of Interval Recognition was not revised; its form is identical to the Pre Test of Interval Recognition (used for Post and Terminal Tests as well).

## B. Reliability of the Test of Interval Recognition

Because the same form of the Test of Interval Recognition was used for both pilot and pre tests, it was feasible to use a Spearman Rank Correlation Coefficient ($r_s$) (see pages C-1 and C-2 of this report for the formulae employed) to relate pilot and pre tests given to fourth, fifth, and sixth grade pupils in the experimental school who received both Pilot and Pre Tests of Interval Recognition.

The Spearman Rank Correlation Coefficients and their significance for the Pilot and Pre Tests of Interval Recognition appear in tabular form on the following page. It will be noted that the significance of the correlation coefficient for the Fourth Grade is slightly greater than the .10 level. It is felt that the guess factor contributed to this low reliability test result; however, the ranges of scores for pilot and pre tests were more equal in the Fourth Grade tests than they were at any other grade level.

All of the other correlation coefficients are significant at the .05 level or less.

## TABLE VII

## TEST OF INTERVAL RECOGNITION PILOT AND PRE TESTS COMPARED: THE SIGNIFICANCE OF SPEARMAN RANK CORRELATION COEFFICIENTS ($\underline{r_s}$) IN INDICATING AN ASSOCIATION BETWEEN THEM

| Group | N | $\underline{r_s}$ | $\underline{t}$ | Level of Significance | | Medians[a] (Perfect Score=100) | | Ranges of Scores | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Less Than | Greater Than | Pilot Test | Pre Test | Pilot Test | Pre Test |
| Grade 4 | 44 | .1864 | 1.254 | . . .[b] | .10 | 7.6 | 9.6 | 0-20 | 0-20 |
| Grade 5 | 52 | .5624 | 4.777 | .0005 | . . .[c] | 10.7 | 11.1 | 0-45 | 0-65 |
| Grade 6 | 60 | .6533 | 6.513 | .0005 | . . .[d] | 11.5 | 12.2 | 0-65 | 0-50 |
| Grades 4, 5, and 6 Combined.. | 156 | .4536 | 6.251 | .0005 | . . .[e] | 10.4 | 10.9 | 0-65 | 0-65 |

[a] Based on Scores ("Percentage Score") for Test of Interval Recognition.

[b] Not available, since its level of significance would be much greater than .10, and such a $\underline{t}$ does not appear on standard tables.

[c] Significance interpolated: at .0005 level of significance, if $\underline{df} = 40$, $\underline{t} = 3.551$; if $\underline{df} = 60$, $\underline{t} = 3.460$. In this case $\underline{df}$ (i.e., N-2) = 50.

[d] Significance interpolated as in note "c" just above, but in this case $\underline{df}$ (i.e., N-2)=58.

[e] Not available from standard tables; when $\underline{df}$ = more than 120 to infinity, $\underline{t} = 3.291$ at .0005 level of significance. In this case, $\underline{df}$ (i.e., N-2) = 154.

## C. Instructions for Administering Test of Interval Recognition

### 1. PREPARATION

#### Materials Needed for Each Pupil

Chair
Writing surface to accomodate 8½ x 11 paper (desk, table, or folding-arm chair);
Two sharpened pencils (erasers not required);
One-page answer sheet entitled "Interval Recognition" (see Fig. D48) placed face up.

#### Materials Needed for the Proctor

Bulletin board or blackboard space for posting previously prepared visual aids (see Fig. D1) and thumb tacks if the former is used;
Masking tape for affixing visual aids to each other, and for mounting master aid if blackboard space is used;
Table for tape recorder and visual aids (if a chalk tray is available it is ideal for the additional visual aids needed);
Tape recorder which will play at 7½ ips;
Tape recording entitled "Interval Recognition" (recorded at 7½ ips);
Large pointer for proctor to use in pointing to visual aids;
Sign to be affixed face outward to door of room: "TESTING. PLEASE DO NOT KNOCK OR ENTER";
A piano for assisting in the PUPILS' question period;
A watch with a sweep second hand for timing tape stops.

### 2. PROCEDURE

Allow forty minutes for the administration of this test. This time period includes provision for seating the pupils, distributing test papers, playing the test tape with only the four stops described in the test below (allowing time for extensive questioning by the pupils), collecting the test papers, and dismissing the pupils. The running time of the test tape, without stops, is 29 mins. 19 secs.

As soon as the pupils are seated and quiet, start the test tape.

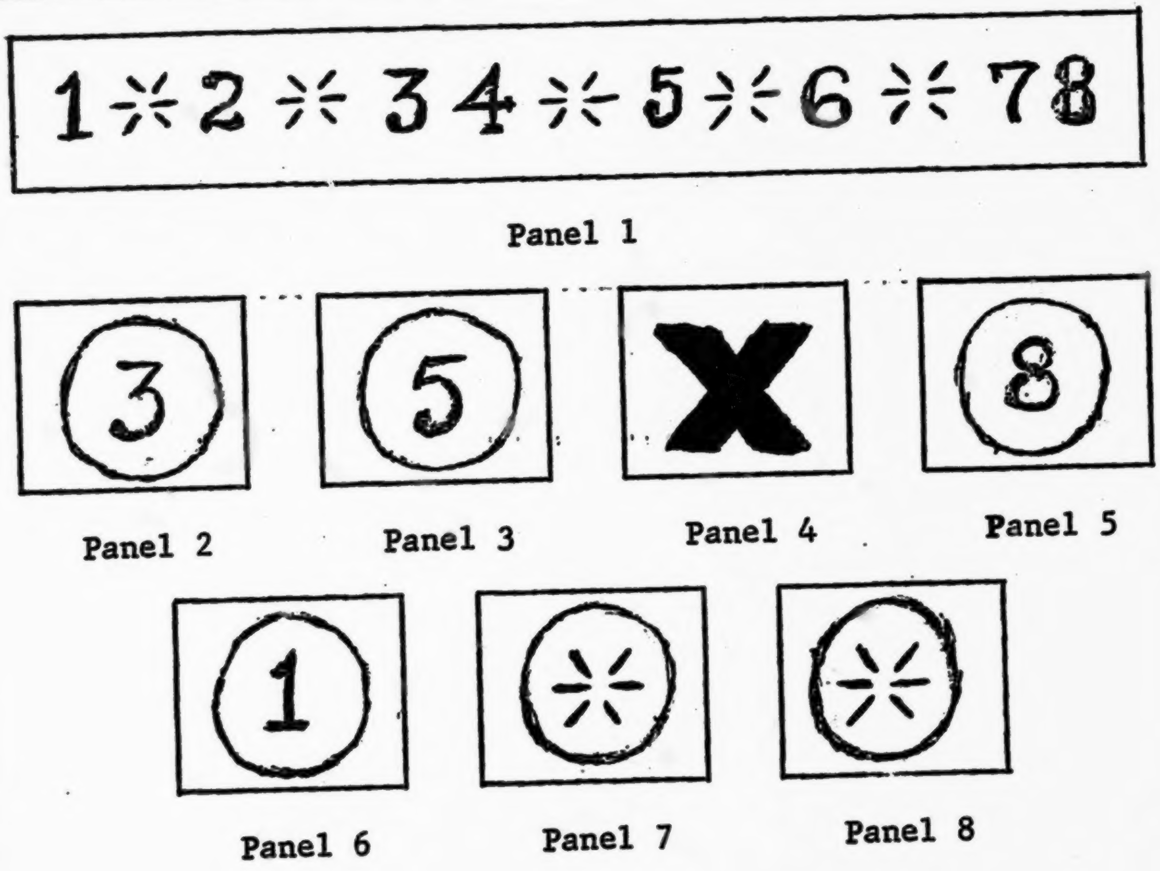


Fig. D1.--Test of Interval Recognition visual aids.

(For an explanation of the contruction of these visual aids, see "Explanation of Fig. D1." appearing below.)

Explanation of Fig. D1. All panels were made from white poster board and inked with black "Speedry" ink. Panel 1 should be made large enough for the pupils to see clearly from any point in the testing room. The author's Panel 1 was 53" x 8". The size of the encircled numerals and figures on Panels 2, 3, 5, 6, 7, and 8 should be the same size as the corresponding numerals and figures on Panel 1. The size of these six panels should be large enough to cover the corresponding numerals and figures on Panel 1, but not so large as to overlap onto one of the other numerals or figures of Panel 1. The author used 4½" squares for these six panels. Panel 4 is to be cut around the outline of the "X". The cut-out of the "X" itself made by the author was 5" square. Small lengths of masking tape rolled between the thumb and forefinger with the adhesive side out can be employed to affix Panels 2 through 8 as required in the instructions for administering the test.

## 3. TEXT OF THE TAPE

Give me your attention, please. Fill in your full name, grade, and room number at the top of the test paper.

(STOP THE TEST TAPE. Do not begin the tape again until you are sure that all pupils have finished filling in the information required. The tape includes a pause of three seconds between the last word of the test previously heard, "...paper.", and the first word of the text which follows, "Put...". START THE TEST TAPE AGAIN.).

Put your pencils down and listen carefully. This is a test of interval recognition. We will try to find out how well you recognize intervals. When I strike two tones at once,

*

PIANO

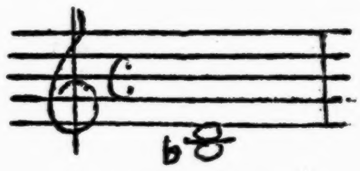


Fig. D2

I have sounded an interval. Or, I could play the lower tone first and then the upper tone,

PIANO

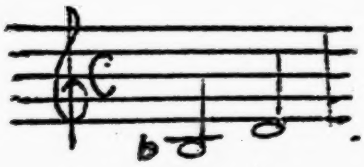


Fig. D3

and still have sounded an interval. Or, I could also play the tones separately, holding each tone;

PIANO

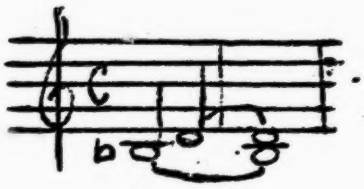


Fig. D4

this would still be sounding an interval.

* All musical examples recorded at MM = 60

Any interval can be measured (not with a ruler), but with a major scale;

**PIANO**

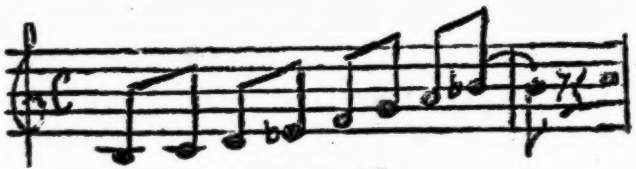


Fig. D5

giving each note a number:

**PIANO**

**VOICE**

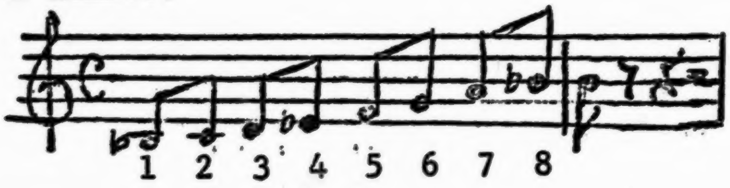


Fig. D6

You sing it now. Ready,

**PIANO**

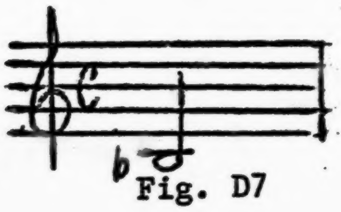


Fig. D7

sing!

(PROCTOR and PUPILS join with PIANO and VOICE.).

(PIANO and VOICE as in Fig. D6.).

We measure an interval in this way: we call the lower tone of the interval, "1". We quickly sing up the major scale with numbers until we reach the higher tone of the interval. When we reach the higher tone of the interval, we stop. We remember that number. For example, in the interval

**PIANO**

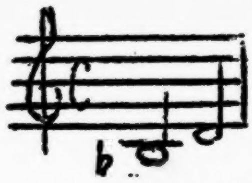


Fig. D8

we sing "1" for the lower tone. Ready,

**PIANO**

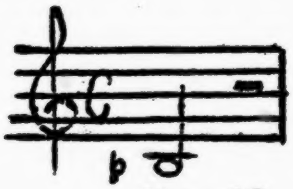
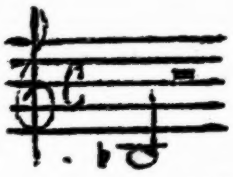


Fig. D9

(PROCTOR gives upbeat after "Sing!" to alert PUPILS to their participation.).

Sing!
PIANO
and
VOICE



(Joined by voices of PROCTOR and PUPILS)

Fig. D10

We quickly sing up the major scale with numbers, until we reach the higher tone of the interval:

PIANO

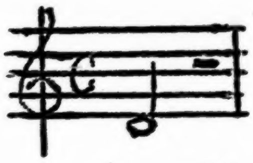


Fig. D11

like this:

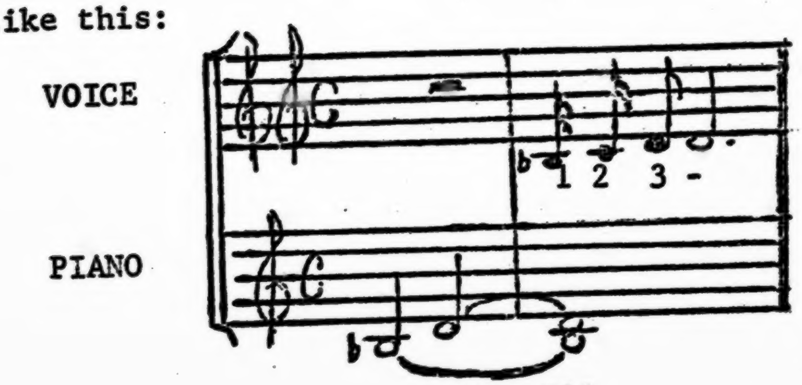
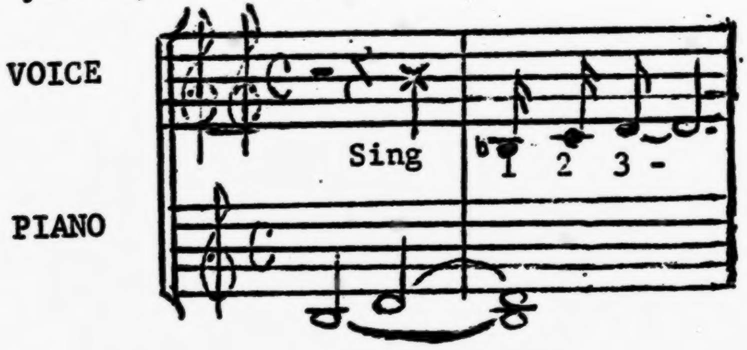


Fig. D12

Now you try! Ready,



(Joined by voices of PROCTOR and PUPILS)

Fig. D13

The higher tone of the interval is "3". We remember that number. On the board...

(PROCTOR moves to right of Panel 1 of Fig. D1 holding Panel 2 of Fig. D1.).

...your teacher will circle the number "3" to show the answer.

(PROCTOR affixes Panel 2 of Fig. D1 to cover the number "3" on Panel 1 of Fig. D1.).

Now let us do some sample problems.

(PROCTOR removes Panel 2 of Fig. D1 from Panel 1 of Fig. D1.).

I will sound the two tones of the interval you are to measure for Sample A. First, I will sound both tones at once. Listen for the lower tone, and, as soon as you can, sing it, calling it "1". Ready to sing as soon as you can:

PIANO

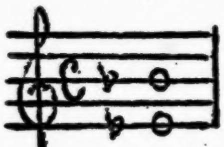


Fig. D14

(PROCTOR and PUPILS sing "1" to pitch played)

You should have sung:

PIANO
and
VOICE

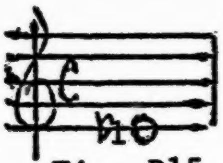


Fig. D15

Now I will play the lower tone and higher tone separately. As soon as you hear both tones, quickly sing up the major scale from the lower tone, "1", to the higher tone, remembering the number of the higher tone:

PIANO

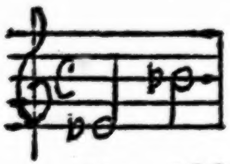


Fig. D16

(The tape includes a three second pause for PROCTOR and PUPIL response.).

Find the number you remembered in the line marked "Sample A".

(The tape includes a two second pause for PUPILS to find the line on their paper marked "Sample A".).

Pick up your pencil and circle that number.

(The tape includes a seven second pause for this task.).

Put your pencil down.

(PROCTOR moves to right of Panel 1 of Fig. D1 holding Panels 2, 3,and 4 of Fig. D1.).

The correct answer was "5".

(PROCTOR affixes Panel 3 of Fig. D1 to cover the number "5" on Panel 1 of Fig. D1.).

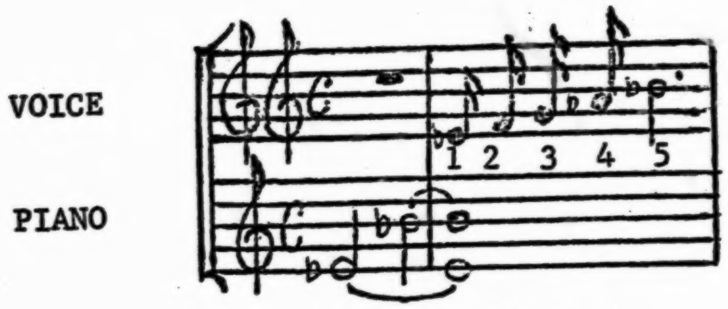


Fig. D17

If you circled the wrong number...

(PROCTOR places Panel 2 so that it covers the number "3" of Panel 1 of Fig. D1.).

...cross out the incorrect number...

(PROCTOR removes Panel 2 of Fig. D1 from the number "3" of Panel 1 of Fig. D1, replacing it with Panel 4 of Fig. D1 to cross out the number "3" of Panel 1 of Fig. D1.).

...and circle "5".

(PROCTOR again affixes Panel 3 of Fig. D1 to cover the number "5" of Panel 1 of Fig. D1.).

(The tape includes a pause of ten seconds for the PUPILS to do this task.).

(PROCTOR removes Panels 2, 3, and 4 of Fig. D1 from the latter.).

In the remaining samples and problems, I will play the interval three times. The first time both tones will be heard at once:

PIANO

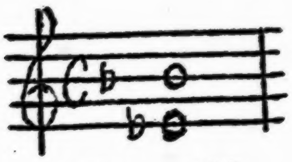


Fig. D18

The second time, the two tones will be heard separately; first the lower tone, and then the higher tone:

PIANO

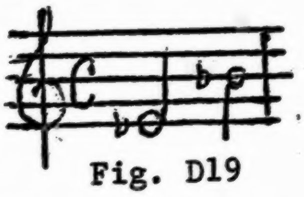


Fig. D19

The third time, the two tones will be heard separately, but both will be held:

PIANO

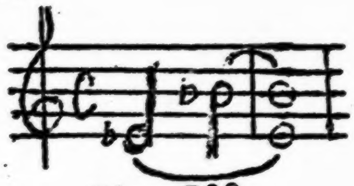
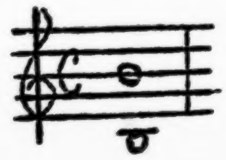


Fig. D20

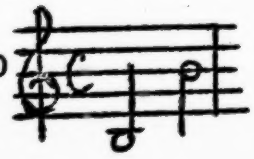
Be ready to measure as soon as you can with the numbers of a major scale, calling the lower tone "1" and stopping with the number of the higher tone of the interval. However, don't sing aloud (not even softly). You must sing to yourself. Think of the sound but don't let the sound come out. Try that now as we do Sample B. Listen carefully:

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D21.).

PIANO



PIANO



PIANO

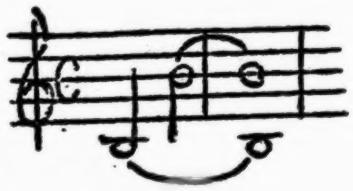


Fig. D21

Remember the number of the higher tone of the interval. Find that number in the line marked "Sample B".

(The tape includes a pause of two seconds for PUPILS to find the line on their paper marked "Sample B".).

Pick up your pencil and circle that number.

(The tape includes a pause of seven seconds for the PUPILS to do this task.).

Pencils down.

(PROCTOR moves to right of Panel 1 of Fig. D1 holding Panels 3, 4, and 5 of Fig. D1).

The correct answer was "8".

(PROCTOR affixes Panel 5 of Fig. D1 to cover the number "8" on Panel 1 of Fig. D1.).

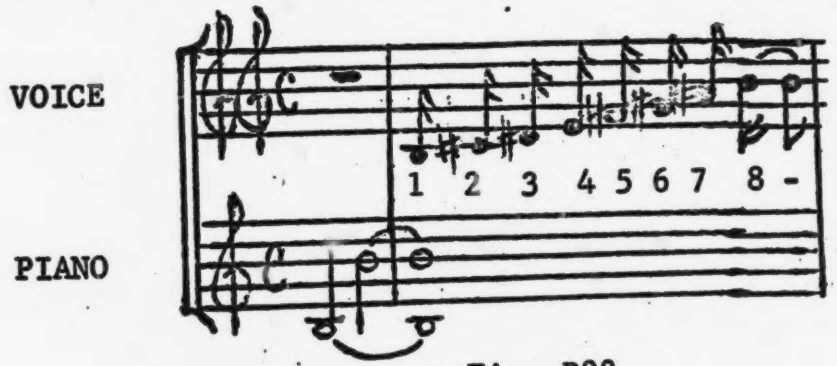


Fig. D22

If you circled the wrong number...

(PROCTOR places Panel 3 so that it covers the number "5" of Panel 1 of Fig. D1.).

...cross out the incorrect number...

(PROCTOR removes Panel 3 of Fig. D1 from the number "5" of Panel 1 of Fig. D1, replacing it with Panel 4 of Fig. D1 to cross out the number "5" of Panel 1 of Fig. D1.).

...and circle "8".

(PROCTOR again affixes Panel 5 of Fig. D1 to cover the number "8" of Panel 1 of Fig. D1.).

(The tape includes a pause of ten seconds for the PUPILS to do this task.).

Ready now to try Sample C. Listen carefully. Remember to sing to yourself, not "out loud".

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D23.).

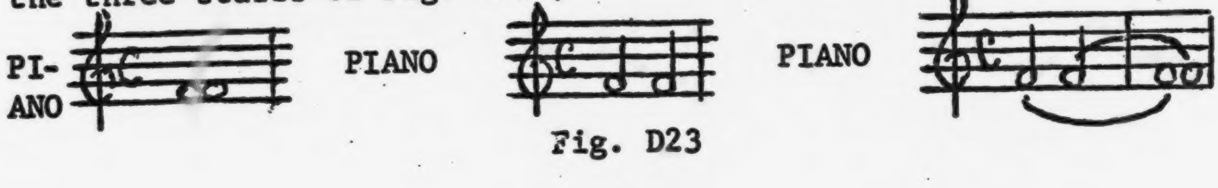


Fig. D23

Remember the number of the higher tone of the interval. Find that number in the line marked "Sample C".

(The tape includes a pause of two seconds for PUPILS to find the line on their paper marked "Sample C".).

Pick up your pencil and circle that number.

(The tape includes a pause of seven seconds for the PUPILS to do this task.).

Put your pencil down.

(PROCTOR moves to right of Panel 1 of Fig. D1 holding Panels 4, 5, and 6 of Fig. D1.).

The correct answer was "1".

(PROCTOR affixes Panel 6 of Fig. D1 to cover the number "1" on Panel 1 of Fig. D1.).

Perhaps you notices the lower tone, "1" and the "higher" tone sounded the same; therefore, only number "1" of the major scale could be sung:

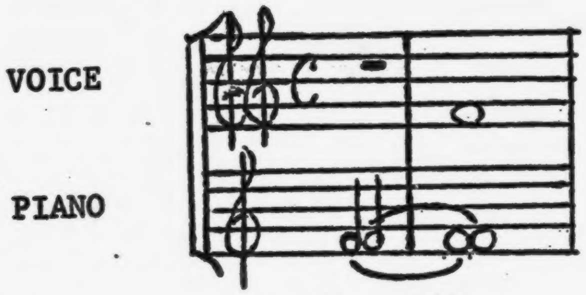


Fig. D24

If you circled the wrong number...

(PROCTOR places Panel 5 of Fig. D1 so that it covers the number "8" of Panel 1 of Fig. D1.).

...cross out the incorrect number...

(PROCTOR removes Panel 5 of Fig. D1 from the number "8" of Panel 1 of Fig. D1, replacing it with Panel 4 of Fig. D1 to cross out the number "8" of Panel 1 of Fig. D1.).

...and circle "1".

(PROCTOR again affixes Panel 6 of Fig. D1 to cover the number "1" of Panel 1 of Fig. D1.).

The tape includes a pause of ten seconds for the PUPILS to do this task.).

Now we will go on to Sample D. In Sample D, as well as in some of the problems that follow, the higher tone of the interval will not exactly match the major scale tones you sing to yourself. Instead, the higher tone of the interval will be between two scale numbers.

(PROCTOR moves to right of Panel 1 of Fig. D1 holding pointer and Panel 7 of Fig. D1.).

Listen for the tones between...

(PROCTOR points to each of the asterisks in turn from left to right on Panel 1 of Fig. D1 as each group of two numbers is mentioned.).

..."1" and "2", "2" and "3", "4" and "5", "5" and "6", or "6" and "7".

(As each of the tones in Fig. D25 are played, PROCTOR points to appropriate asterisk for only those tones in the PIANO part which appear directly above quarter rests in the VOICE part.).

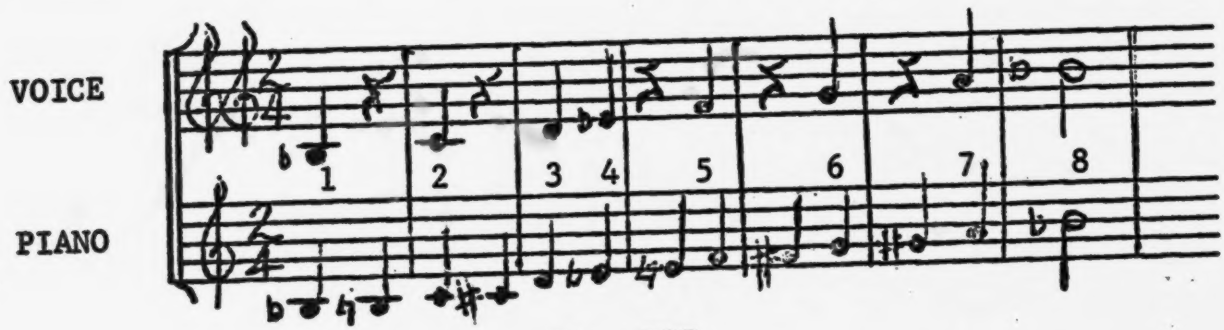


Fig. D25

The star shapes,...

(PROCTOR holds up Panel 7 of Fig. D1 for PUPILS to see)

...called asterisks, that you see between...

(PROCTOR points to each of the asterisks in turn from left to right on Panel 1 of Fig. D1 as each group of two numbers is mentioned.).

..."1" and "2", "2" and "3", "4" and "5", "5" and "6", and "6" and "7" stand for the tones that are between those numbers of the major scale. In this sample you will have to remember the numbers of the scale just below and just above the higher tone of the interval. On the answer sheet, you will circle the asterisk between...

(PROCTOR uses Panel 7 of Fig. D1 to cover each of the asterisks in turn from left to right on Panel 1 of Fig. D1 as each group of two numbers is mentioned.).

..."1" and "2", "2" and "3", "4" and "5", "5" and "6", or "6" and "7"; whichever two numbers are just above and below the higher tone of the interval. Ready to try Sample D. Listen carefully:

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D26.).

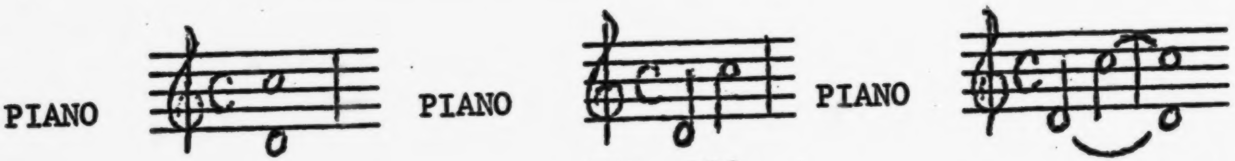


Fig. D26

Pick up your pencil, and circle the asterisk between...

(PROCTOR uses Panel 7 of Fig. D1 to cover each of the asterisks in turn from left to right on Panel 1 of Fig. D1 as each group of two numbers is mentioned.).

..."1" and "2", "2" and "3", "4" and "5", "5" and "6", or "6" and "7"; whichever numbers were just above and below the higher tone of the interval---you circle the asterisk between those two numbers.

(The tape includes a pause of eight seconds for the PUPILS to do this task.).

Pencils down.

(PROCTOR moves to right of Panel 1 of Fig. D1 holding Panels 4, 7, and 8 of Fig. D1.).

The correct answer was the asterisk between "6" and "7".

(PROCTOR affixes Panel 7 of Fig. D1 to cover the asterisk between the numbers "6" and "7" on Panel 1 of Fig. D1.).

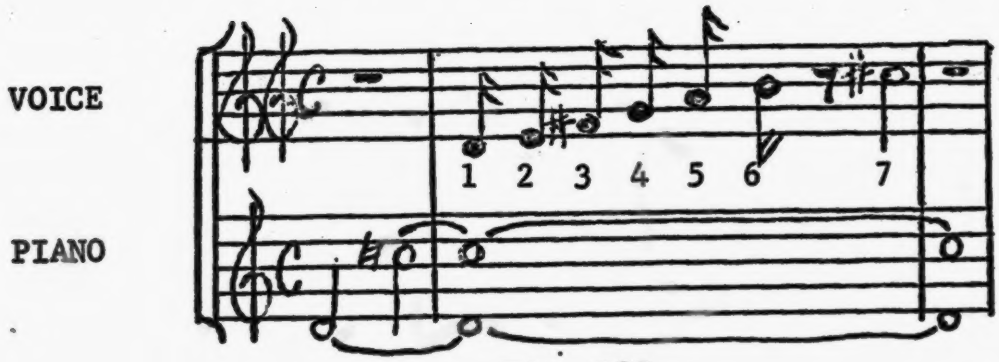


Fig. D27

(PROCTOR STOPS THE TEST TAPE, and then states: "If you circled the wrong asterisk...").

(PROCTOR replaces Panel 7 of Fig. D1 so that it covers the asterisk between the numbers "5" and "6" instead of the asterisk between the numbers "6" and "7" of Panel 1 of Fig. D1.).

(PROCTOR continues: "...cross out the incorrect asterisk...").

(PROCTOR affixes Panel 4 of Fig. D1 to cross out Panel 7 of Fig. D1 which served as a circled asterisk between numbers "5" and "6" on Panel 1 of Fig. D1.).

(PROCTOR continues: "...and circle the correct asterisk between the number "6" and "7".).

(PROCTOR affixes Panel 8 of Fig. D1 to cover the asterisk between numbers "6" and "7" on Panel 1 of Fig. D1. PROCTOR allows ten seconds for the PUPILS to do this task. START THE TEST TAPE AGAIN.).

In the twenty problems that follow you will hold your pencil ready to circle the answer. Sometimes the answer will be a number, sometimes an asterisk. Circle as soon as you are sure of your answer. If you aren't sure, guess. Each interval will be played three times with pauses between to allow you time to quickly sing the numbers of a major scale to yourself! Not aloud! I will only speak to you to tell you to finish one problem and be ready for the next problem. If you have any questions now, ask your teacher.

(PROCTOR STOPS THE TEST TAPE and answers questions put by PUPILS. PROCTOR should use all of the sample problem music examples by singing and performing them at the piano to make the test procedure clear to the PUPILS. Before starting the test tape again, PROCTOR states: "Now remember: if you make a mistake, don't use an eraser. Simply make a "X" over the answer you don't like and circle an answer you do like. Sometimes the answer will be a number, sometimes an asterisk. Circle as soon as you are sure of your answer. If you aren't sure, guess. Each interval will be played three times with pauses between to allow you time to quickly sing the numbers of a major scale to yourself! Not aloud! You will only be told to finish one problem and be ready for the next problem. Listen now to the tape recorder." START THE TEST TAPE AGAIN.).

Pick up your pencils now. Don't put them down until the end of the test when I tell you to put them down. Ready for Problem 1. Listen carefully:

(The tape includes a pause of seven seconds after each of the three staffs.

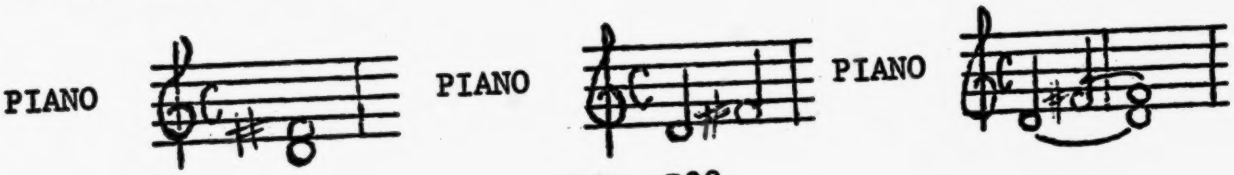


Fig. D28

Now you should be finished with Problem 1. Be ready for Problem 2.

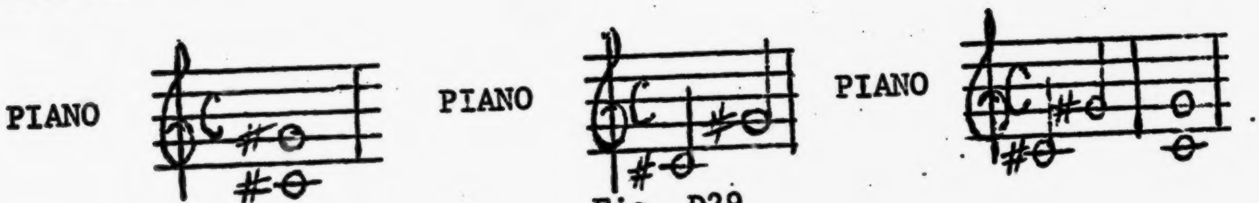


Fig. D29

Now you should be finished with Problem 2. Be ready for Problem 3.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D30.).

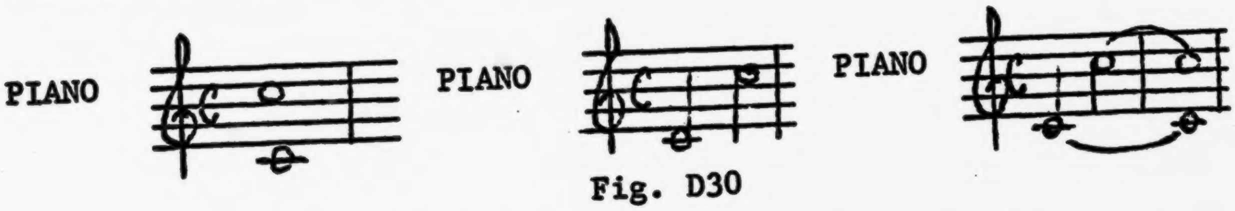


Fig. D30

Now you should be finished with Problem 3. Be ready for Problem 4.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D31.).

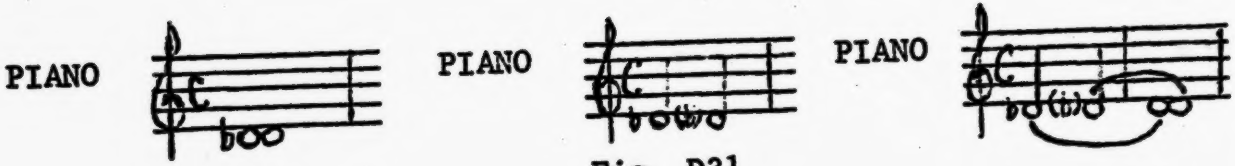

PIANO
PIANO
PIANO

Fig. D31

Now you should be finished with Problem 4. Be ready for Problem 5.

(The tape includes a pause of seven seconds after each of the three staffs of Fig.D32.).

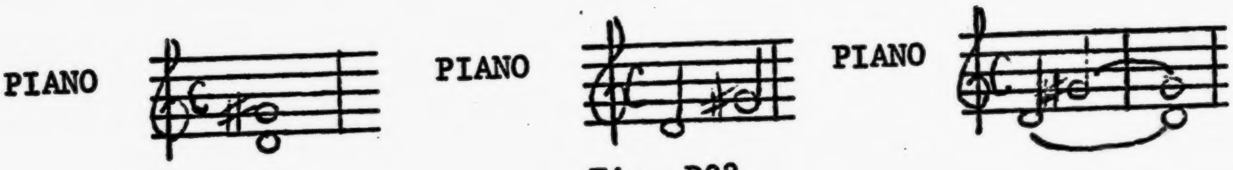

PIANO
PIANO
PIANO

Fig. D32

Now you should be finished with Problem 5. Be ready for Problem 6.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D33.).

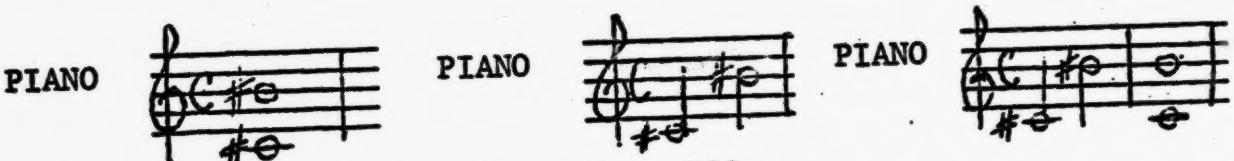

PIANO
PIANO
PIANO

Fig. D33

Now you should be finished with Problem 6. Be ready for Problem 7.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D34.).

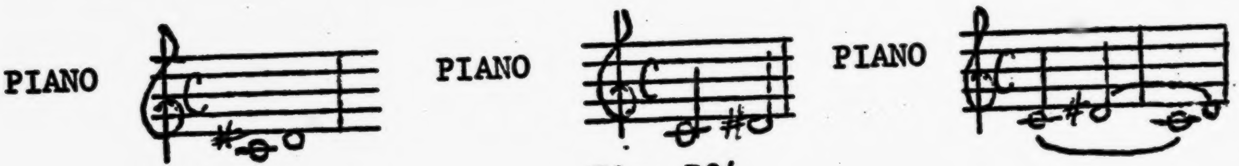

PIANO
PIANO
PIANO

Fig. D34

Now you should be finished with Problem 7. Be ready for Problem 8.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D35.).

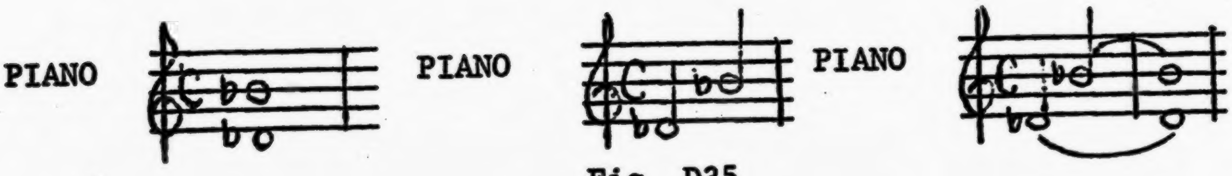


Fig. D35

Now you should be finished with Problem 8. Be ready for Problem 9.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D36.).

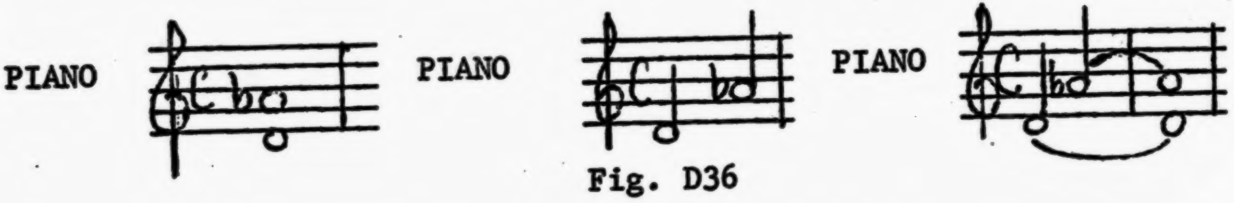


Fig. D36

Now you should be finished with Problem 9. Be ready for Problem 10.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D37.).

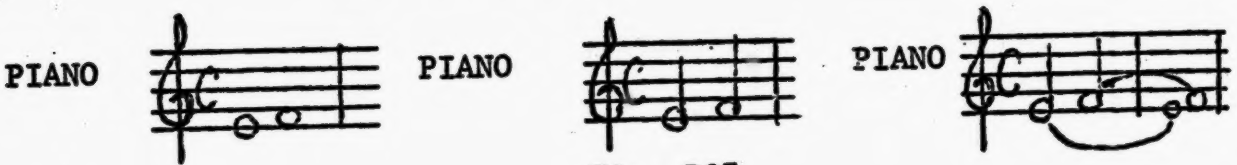


Fig. D37

Now you should be finished with Problem 10. Rest a moment, but keep your pencil ready.

(PROCTOR STOPS THE TEST TAPE and states: "You may put your pencils down. Lean back and stretch your arms. Relax for one minute, and then we will do the last half of the test." PROCTOR allows sixty seconds of rest, and then STARTS THE TEST TAPE AGAIN.).

(The tape has a thirteen second pause between the last word of the text of the tape, "...ready.", and the next word of the text of the tape, "Now...".).

Now have your pencil ready. We will do Problem 11.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D38.

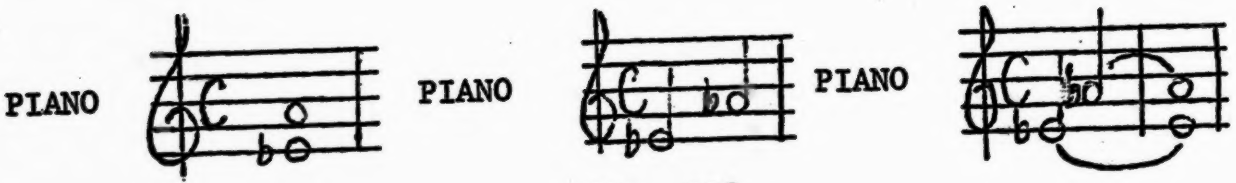

PIANO
PIANO
PIANO

Fig. D38

Now you should be finished with Problem 11. Be ready for Problem 12.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D39.).

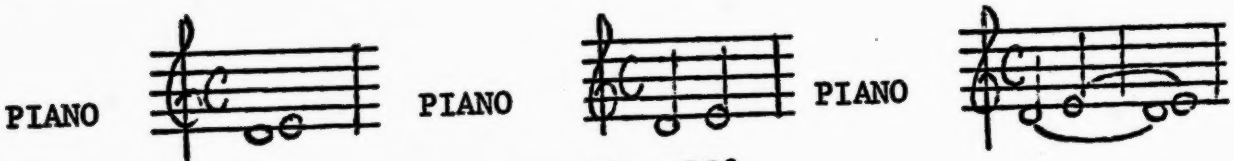

PIANO
PIANO
PIANO

Fig. D39

Now you should be finished with Problem 12. Be ready for Problem 13.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D40.).

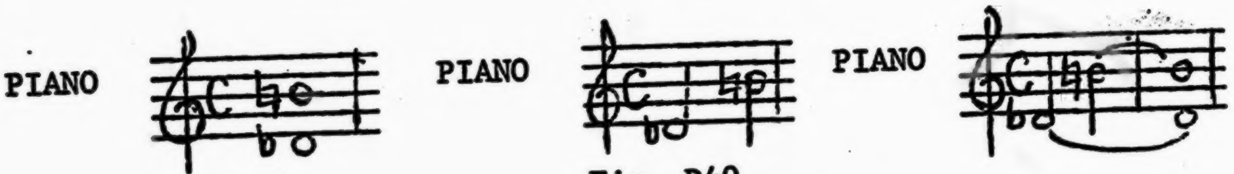

PIANO
PIANO
PIANO

Fig. D40

Now you should be finished with Problem 13. Be ready for Problem 14.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D41.).

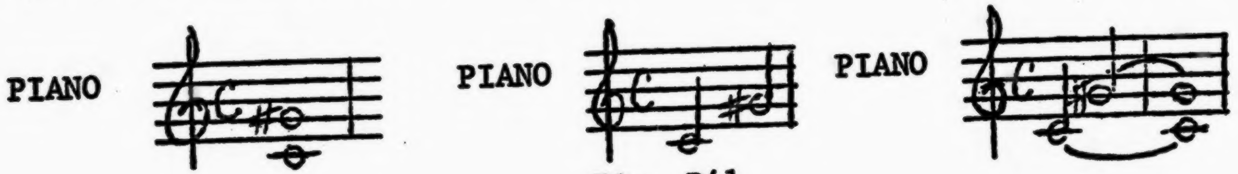

PIANO
PIANO
PIANO

Fig. D41

Now you should be finished with Problem 14. Be ready for Problem 15.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D42.).

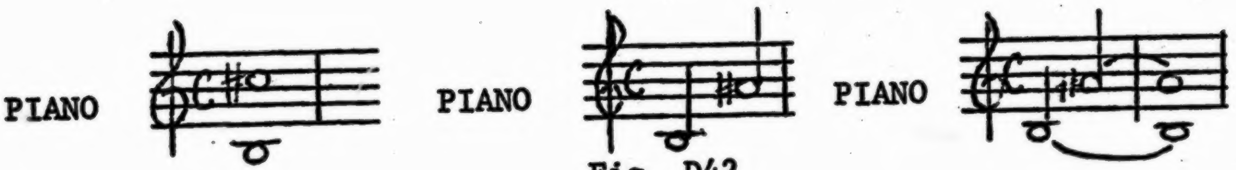

PIANO
PIANO
PIANO

Fig. D42

Now you should be finished with Problem 15. Be ready for Problem 16.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D43.).

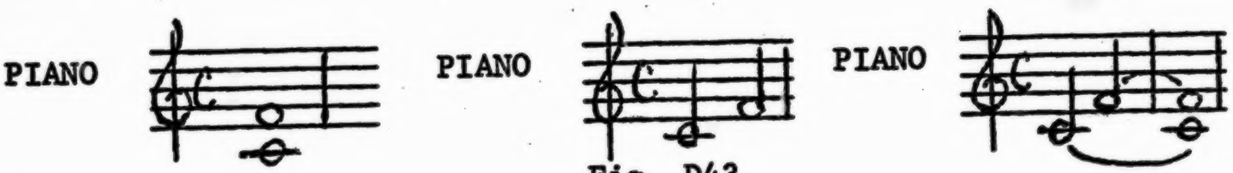

PIANO
PIANO
PIANO

Fig. D43

Now you should be finished with Problem 16. Be ready for Problem 17.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D44.).

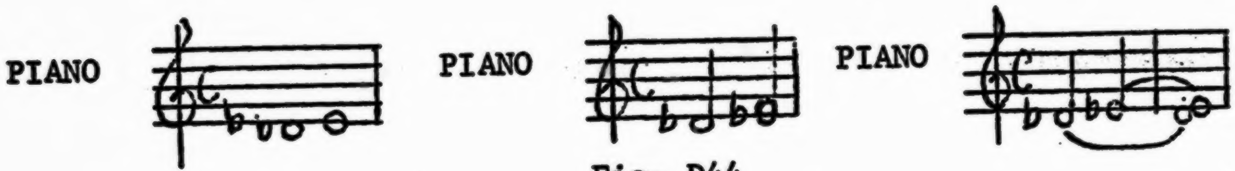

PIANO
PIANO
PIANO

Fig. D44

Now you should be finished with Problem 17. Be ready for Problem 18.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D45.).

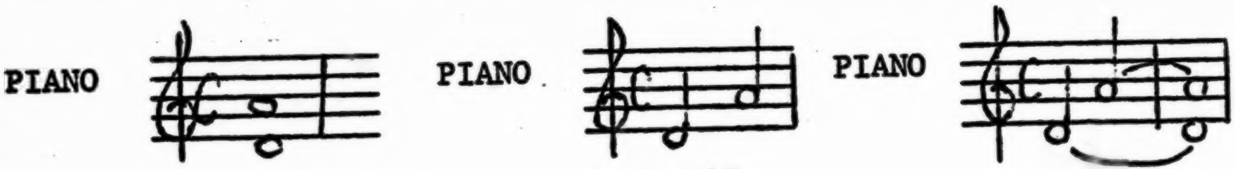

PIANO
PIANO
PIANO

Fig. D45

Now you should be finished with Problem 18. Be ready for Problem 19.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D46.).

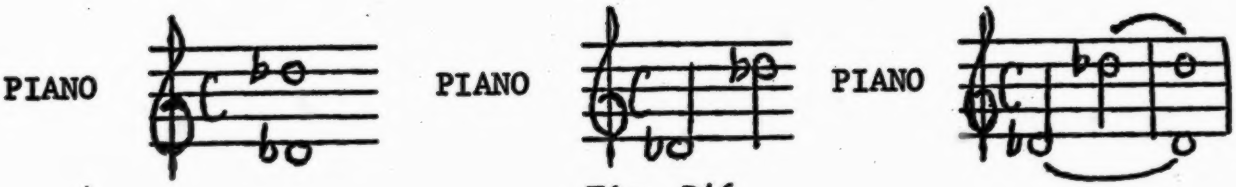


Fig. D46

Now you should be finished with Problem 19. Be ready for Problem 20.

(The tape includes a pause of seven seconds after each of the three staffs of Fig. D47.).

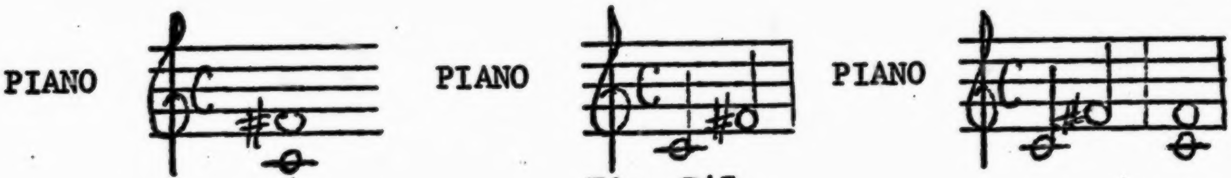


Fig. D47

Now you should be finished with Problem 20. Put your pencils down. This is the end of the test, "Interval Recognition". Listen to your teacher for further instructions.

(PROCTOR gives necessary instructions for collecting papers and for class dismissal.).

NAME________________________________________
GRADE________ ROOM NUMBER__________

INTERVAL RECOGNITION

SAMPLE "A": 1 * 2 * 3 4 * 5 * 6 * 7 8
SAMPLE "B": 1 * 2 * 3 4 * 5 * 6 * 7 8
SAMPLE "C": 1 * 2 * 3 4 * 5 * 6 * 7 8
SAMPLE "D": 1 * 2 * 3 4 * 5 * 6 * 7 8

1. 1 * 2 * 3 4 * 5 * 6 * 7 8
2. 1 * 2 * 3 4 * 5 * 6 * 7 8
3. 1 * 2 * 3 4 * 5 * 6 * 7 8
4. 1 * 2 * 3 4 * 5 * 6 * 7 8
5. 1 * 2 * 3 4 * 5 * 6 * 7 8
6. 1 * 2 * 3 4 * 5 * 6 * 7 8
7. 1 * 2 * 3 4 * 5 * 6 * 7 8
8. 1 * 2 * 3 4 * 5 * 6 * 7 8
9. 1 * 2 * 3 4 * 5 * 6 * 7 8
10. 1 * 2 * 3 4 * 5 * 6 * 7 8
11. 1 * 2 * 3 4 * 5 * 6 * 7 8
12. 1 * 2 * 3 4 * 5 * 6 * 7 8
13. 1 * 2 * 3 4 * 5 * 6 * 7 8
14. 1 * 2 * 3 4 * 5 * 6 * 7 8
15. 1 * 2 * 3 4 * 5 * 6 * 7 8
16. 1 * 2 * 3 4 * 5 * 6 * 7 8
17. 1 * 2 * 3 4 * 5 * 6 * 7 8
18. 1 * 2 * 3 4 * 5 * 6 * 7 8
19. 1 * 2 * 3 4 * 5 * 6 * 7 8
20. 1 * 2 * 3 4 * 5 * 6 * 7 8

Fig. D48.--Test of Interval Recognition Answer Sheet (Facsimile).

## D. Instructions for Scoring Test of Interval Recognition

1. Based on the correct responses to the test (see Fig.D49), a template was designed to aid in correcting the test (see Fig.D50). All the squares of this template are to be cut out before the latter is used.

2. Before using the template, each test paper must be examined for the following:

a. Erasures. Any erasures made by the testee must be covered with an "X" made in ink by the scorer.

b. Multiple Response. If the testee has made two or more circles in the same problem, all circles in the problem are to be covered with a "// " mark made by the scorer.

3. Using the template over each test paper, employ a red pencil to make a check mark (✓) wherever a pencilled, circled number or asterisk appears through one of the squares of the template. Ignore sample problems. Do not check mark where the following occur: "// " mark in ink, "X" mark in pencil or ink, blackened circle over number in pen or ink.

4. The total of the number of check marks made by the scorer on the test paper equals the "No. Right". Consult the Scoring Table (see Table VIII) for "Percentage Score". The "No. Right" with the "Percentage Score" just beneath is to be recorded in the upper right hand corner of each test paper.

---

This experimenter also entered the following information on each test paper:

1. The date of the test.

2. A test identification number. A number was assigned each test paper, numbering from the highest score in the lowest grade level to the lowest score in the highest grade level.

(The percentage score and Item 2 above were entered on each pupil's Data Sheet.).

NAME________________________________________

GRADE__________ ROOM NUMBER____________

## INTERVAL RECOGNITION

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE "A": | 1 | * | 2 | * | 3 | 4 | * | [✓ 5] | * | 6 | * | 7 | 8 |
| SAMPLE "B": | 1 | * | 2 | * | 3 | 4 | * | 5 | * | 6 | * | 7 | [✓ 8] |
| SAMPLE "C": | [✓ 1] | * | 2 | * | 3 | 4 | * | 5 | * | 6 | * | 7 | 8 |
| SAMPLE "D": | 1 | * | 2 | * | 3 | 4 | * | 5 | * | 6 | [✓ *] | 7 | 8 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 1 | * | 2 | * | [✓ 3] | 4 | * | 5 | * | 6 | * | 7 | 8 |
| 2. | 1 | * | 2 | * | 3 | 4 | * | [✓ 5] | * | 6 | * | 7 | 8 |
| 3. | 1 | * | 2 | * | 3 | 4 | * | 5 | * | 6 | * | 7 | [✓ 8] |
| 4. | [✓ 1] | * | 2 | * | 3 | 4 | * | 5 | * | 6 | * | 7 | 8 |
| 5. | 1 | * | 2 | * | 3 | 4 | [✓ *] | 5 | * | 6 | * | 7 | 8 |
| 6. | 1 | * | 2 | * | 3 | 4 | * | 5 | * | 6 | * | [✓ 7] | 8 |
| 7. | 1 | * | 2 | [✓ *] | 3 | 4 | * | 5 | * | 6 | * | 7 | 8 |
| 8. | 1 | * | 2 | * | 3 | 4 | * | 5 | * | [✓ 6] | * | 7 | 8 |
| 9. | 1 | * | 2 | * | 3 | 4 | [✓ *] | 5 | * | 6 | * | 7 | 8 |
| 10. | 1 | [✓ *] | 2 | * | 3 | 4 | * | 5 | * | 6 | * | 7 | 8 |
| 11. | 1 | * | 2 | * | 3 | [✓ 4] | * | 5 | * | 6 | * | 7 | 8 |
| 12. | 1 | * | [✓ 2] | * | 3 | 4 | * | 5 | * | 6 | * | 7 | 8 |
| 13. | 1 | * | 2 | * | 3 | 4 | * | 5 | * | 6 | [✓ *] | 7 | 8 |
| 14. | 1 | * | 2 | * | 3 | 4 | * | 5 | [✓ *] | 6 | * | 7 | 8 |
| 15. | 1 | * | 2 | * | 3 | 4 | * | 5 | * | 6 | * | [✓ 7] | 8 |
| 16. | 1 | * | 2 | * | 3 | [✓ 4] | * | 5 | * | 6 | * | 7 | 8 |
| 17. | 1 | * | [✓ 2] | * | 3 | 4 | * | 5 | * | 6 | * | 7 | 8 |
| 18. | 1 | * | 2 | * | 3 | 4 | * | [✓ 5] | * | 6 | * | 7 | 8 |
| 19. | 1 | * | 2 | * | 3 | 4 | * | 5 | * | 6 | * | 7 | [✓ 8] |
| 20. | 1 | * | 2 | * | 3 | 4 | [✓ *] | 5 | * | 6 | * | 7 | 8 |

Fig. D49.--Test of Interval Recognition Answer Sheet (Facsimile marked showing correct responses).

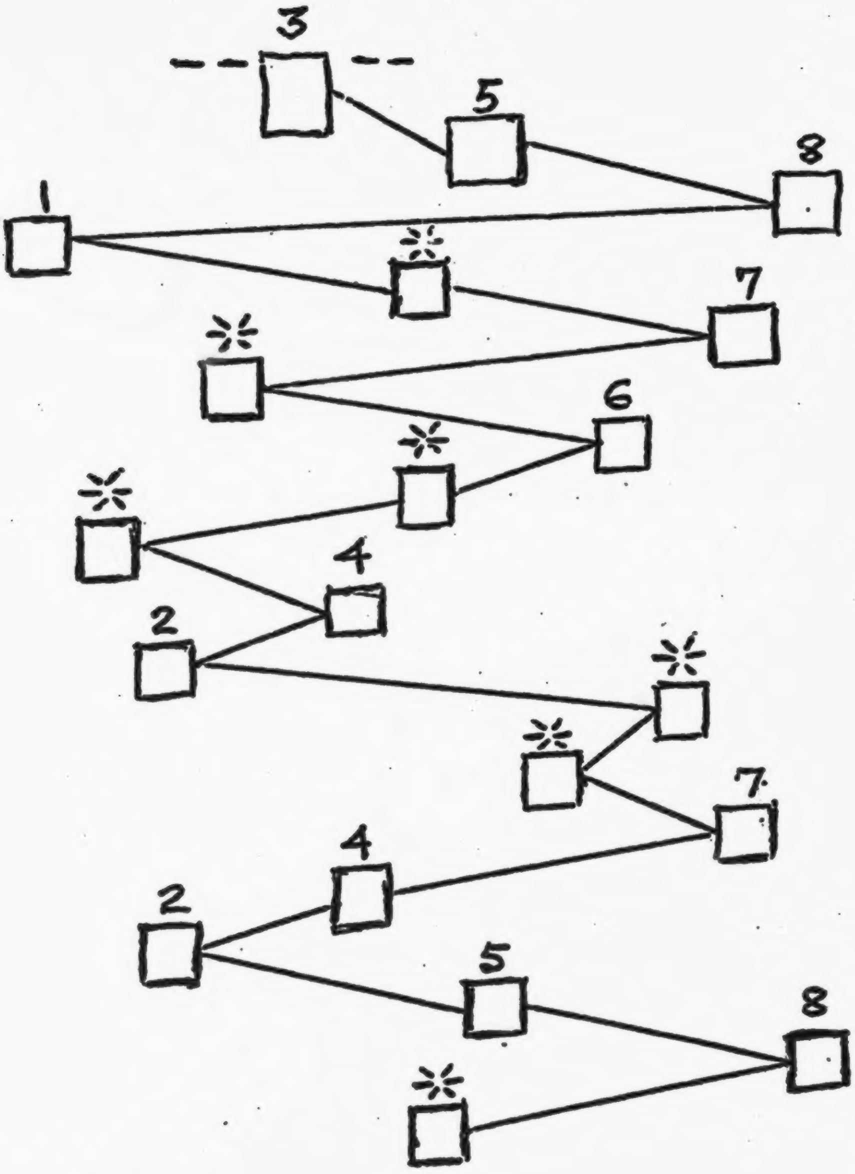

3
5
8
1
*
7
*
6
*
*
4
2
*
*
7
4
2
5
8
*

Fig. D50.--Test of Interval Recognition Scoring Template.

## TABLE VIII

## TEST OF INTERVAL RECOGNITION SCORING TABLE

| No. Wrong | Percentage Score | No. Right |
|---|---|---|
| 0 | 100 | 20 |
| 1 | 95 | 19 |
| 2 | 90 | 18 |
| 3 | 85 | 17 |
| 4 | 80 | 16 |
| 5 | 75 | 15 |
| 6 | 70 | 14 |
| 7 | 65 | 13 |
| 8 | 60 | 12 |
| 9 | 55 | 11 |
| 10 | 50 | 10 |
| 11 | 45 | 9 |
| 12 | 40 | 8 |
| 13 | 35 | 7 |
| 14 | 30 | 6 |
| 15 | 25 | 5 |
| 16 | 20 | 4 |
| 17 | 15 | 3 |
| 18 | 10 | 2 |
| 19 | 5 | 1 |
| 20 | 0 | 0 |

Note: "No. Right" used for ranking purposes.

# APPENDIX E. TEST OF DISCRIMINATION OF PITCH ERRORS AND THE ABILITY TO CORRECT THEM

## A. Pilot Test of Discrimination of Pitch Errors and the Ability to Correct Them

The Pilot Test of Discrimination of Pitch Errors and the Ability to Correct Them, along with the pilot tests in the other four areas of this experiment, was administered as a closing activity in June 1964 to all fourth, fifth, and sixth grade pupils in the experimental school. (This experimenter was not assigned the control school until September 1964; hence control school pupils were not included in the pilot test.) Before the June 1964 tests none of the experimental procedures were taught to the pupils involved in the experiment. All pupils were on summer vacation after that date, and there is no evidence to show that they received any training during the vacation period.

The Pre Test of Discrimination of Pitch Errors and the Ability to Correct Them, along with the pre tests in the other four areas of this experiment, was administered as an opening activity to all fourth, fifth, and sixth grade pupils in both experimental and control schools, when school resumed in September 1964.

The Pilot Test of Discrimination of Pitch Errors and the Ability to Correct Them was not revised; its form is identical to the Pre Test of Discrimination of Pitch Errors and the Ability to Correct Them (used for Post and Terminal Tests as well).

## B. Reliability of the Test of Discrimination of Pitch Errors and the Ability to Correct Them

Because the same form of the Test of Discrimination of Pitch Errors and the Ability to Correct Them was used for both pilot and pre tests, it was feasible to use a Spearman Rank Correlation Coefficient ($\underline{r_s}$) (see pages C-1 and C-2 of this report for the formulae employed) to relate pilot and pre tests given to fourth, fifth, and sixth grade pupils in the experimental school who received both Pilot and Pre Tests of Discrimination of Pitch Errors and the Ability to Correct Them.

The Spearman Rank Correlation Coefficients and their significance for the Pilot and Pre Tests of Discrimination of Pitch Errors and the Ability to Correct Them appear in tabular form on page E-3 of this report. It will be noted that the significance of the correlation coefficient for the Fourth Grade is greater than .10. It is felt that the guess factor contributed to this low reliability test result.

By contrast, all of the other correlation coefficients are significant at the .01 level or less.

## TABLE IX

### TEST OF DISCRIMINATION OF PITCH ERRORS AND THE ABILITY TO CORRECT THEM PILOT AND PRE TESTS COMPARED: THE SIGNIFICANCE OF SPEARMAN RANK CORRELATION COEFFICIENTS ($r_s$) IN INDICATING AN ASSOCIATION BETWEEN THEM

| Group | N | $r_s$ | $t$ | Level of Significance | | Medians[a] (Perfect Score=100) | | Ranges of Scores | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Less Than | Greater Than | Pilot Test | Pre Test | Pilot Test | Pre Test |
| Grade 4 | 47 | .0615 | 0.403 | . . .[b] | .10 | 5.4 | 7.8 | 0-18 | 0-24 |
| Grade 5 | 53 | .3459 | 2.667 | .01 | .005 | 5.3 | 5.2 | 0-20 | 0-24 |
| Grade 6 | 67 | .4957 | 4.650 | .0005 | . . .[c] | 5.0 | 5.7 | 0-48 | 0-44 |
| Grades 4, 5, and 6 Combined.. | 167 | .3769 | 5.274 | .0005 | . . .[d] | 5.4 | 5.8 | 0-48 | 0-44 |

---

[a] Based on Scores ("Percentage Score") for Test of Discrimination of Pitch Errors and the Ability to Correct Them.

[b] Not shown, since its level of significance would be much greater than .10, and such a $t$ does not appear on standard tables.

[c] Not available from standard tables; at .0005 level of significance if, however, $df$ =60, $t$ = 3.460. In this case $df$ (i.e., N-2) = 65.

[d] Not available from standard tables; when $df$ = more than 120 to infinity, $t$ = 3.291 at .0005 level of significance. In this case $df$ (i.e., N-2) = 165.

## C. Instructions for Administering Test of Discrimination of Pitch Errors and the Ability to Correct Them

### 1. PREPARATION

### Materials Needed for Each Pupil

Chair;
Writing surface to accomodate 8½ x 11 inch paper (desk, table, or folding-arm chair);
Two sharpened pencils (erasers not required);
Three-page stapled (in the upper left-hand corner) test form entitled "Finding and Correcting Pitch Errors" placed with page one face up (Fig. E14a).

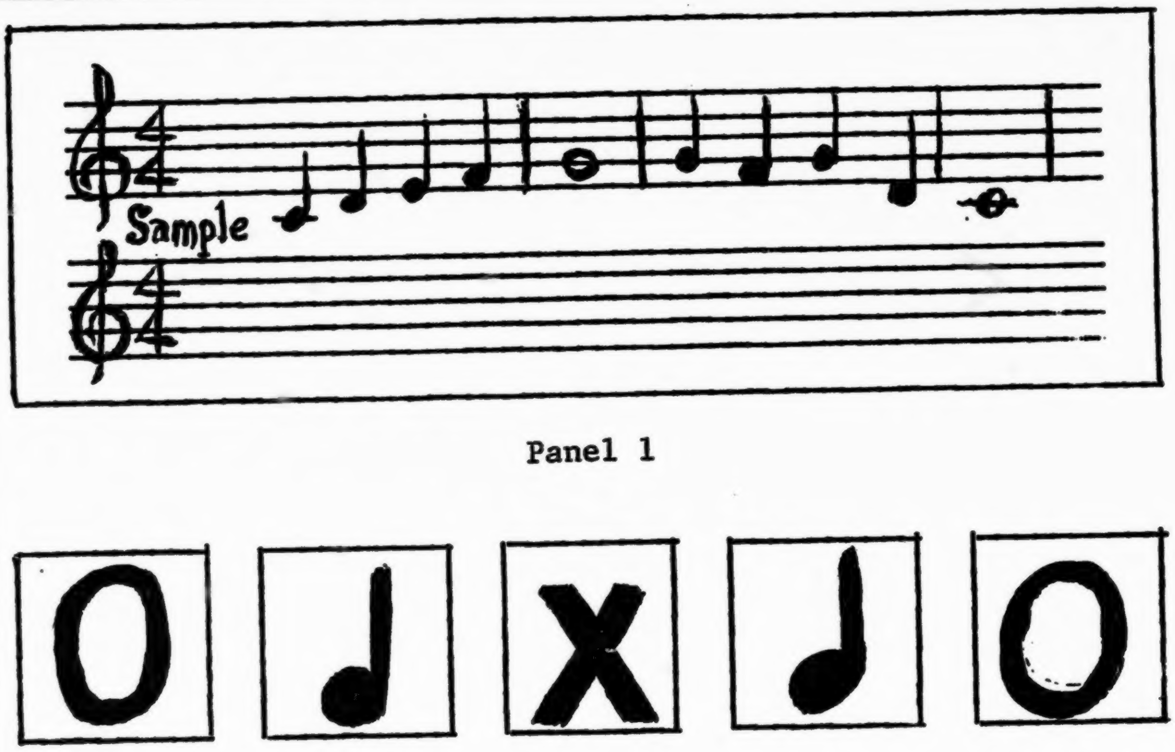
### Materials Needed for the Proctor

Bulletin board or blackboard space for posting previously prepared visual aids (see Fig. E1), and thumb tacks if the former is used;
Masking tape for affixing visual aids to each other, and for mounting master aid if blackboard space is used;
Table for tape recorder and visual aids (if a chalk tray is available it is ideal for the additional visual aids needed);
Tape recorder which will play at 7½ ips;
Tape recording entitled "Finding and Correcting Pitch Errors" (recorded at 7½ ips);
Small pointer for proctor to use in pointing to visual aids;
Sign to be affixed face outward to door of room: "TESTING. PLEASE DO NOT KNOCK OR ENTER".

### 2. PROCEDURE

Allow forty minutes for the administration of this test. This time period includes provision for seating the pupils, distributing test papers, playing the test tape with only the three stops described in the text below (allowing time for extensive questioning by the pupils), collecting the test papers, and dismissing the pupils. The running time of the test tape, without stops, is 21 mins. 42 secs.

As soon as the pupils are seated and quiet, start the test tape.



Panel 1

Panel 2 Panel 3 Panel 4 Panel 5 Panel 6

Fig. E1.--Test of Discrimination of Pitch Errors and the Ability to Correct Them visual aids.

(For an explanation of the contruction of these visual aids, see "Explanation of Fig. E1." appearing below.)

Explanation of Fig. E1. All panels were made from white poster board with black "Speedry" ink. Panel 1 should be made large enough for the pupils to see clearly from any point in the testing room. The author used a panel 28" x 16". Panels 2 through 6 are to be cut out around the shaded portions. The size of the quarter notes (Panels 3 and 5) should match those on Panel 1. The cut out circles (Panels 2 and 6) should be just large enough to enclose the stem and note head of a quarter note of the size employed. The "X" of Panel 4 should be large enough to cross out the size circle employed. Small lengths of masking tape rolled between the thumb and forefinger with the adhesive side out can be employed to affix Panels 2 through 6 as required in the instructions for administering the test.

3. TEXT OF THE TAPE

Give me your attention, please. Print your full name, your grade in school, and the room number of your homeroom at the top of page one of this three-page test.

(STOP THE TEST TAPE.). Do not begin the tape again until you are sure that all pupils have finished filling in the information required. The tape includes a pause of seven seconds between the last word of the text previously heard, "...test.", and the first word of the text which follows, "Pencils...". (START THE TEST TAPE AGAIN.).

Pencils down. Listen carefully. We are going to do a test called "Finding and Correcting Pitch Errors", which has ten problems. In each problem the first part of a familiar tune will be played. As you listen to each tune you will watch the notes for each tune which are printed on your test papers. However, one of the notes in each tune is printed incorrectly; it is an error. It is an error in pitch. That means one printed note in each problem is either printed too high or too low. You are to find the one pitch error in each problem, circle it, and if you can, correct the pitch error. You will do this by drawing your correction of the note on the empty staff underneath each of the problems.

Let us do a sample problem first, at the board.

(PROCTOR steps to the right of the visual aid shown in Fig. E1 as Panel 1.).

Watch the board please. Listen carefully and point...

(PROCTOR holds arm and finger in pointing position toward Panel 1 silently encouraging children to do the same as the sentence is completed.).

...to each note on the board with your finger as you hear it. Ready, listen:

PIANO

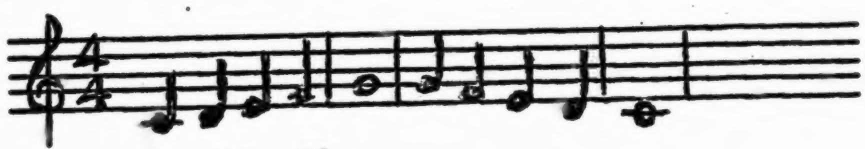


Fig. E2

(PROCTOR and PUPILS point to each note of Fig. E2 as the tones are heard.). In this sample you heard five tones stepping up and five tones stepping down. If you were watching the sample problem on the board, and pointing to each note with your finger as you heard each tone, you probably found that one note was printed too high or too low. If you haven't found the note that is printed too high or too low, you will hear the sample played on the piano two more times. Be sure to point to each note with your finger as you hear each tone played, so you can find the printed note-error. Be sure not to show in any way that you have found the error. Here is the sample tune again:

(PIANO plays as in Fig. E2.).

(PROCTOR and PUPILS point to each note as the tones are heard.).

By this time you should have found the note that was printed incorrectly. As you listen to the sample for the last time, try to decide if the one note that is incorrect is too high or too low. Ready, listen:

(PIANO plays as in Fig. E2.).

(PROCTOR and PUPILS point to each note as the tones are heard.).

Your teacher will now circle the error.

(PROCTOR affixes oblong, Panel 2 of Fig. E1, to encircle the third last note of Panel 1 of Fig. E1.).

Your teacher circled the pitch error. In this sample, the printed note was too high. Since the last five tones got lower...

(PROCTOR traces an imaginary line with his pointer through the center of the last five note heads as the sentence is completed, keeping the pointer as close to the visual aid as possible without touching it.).

...the last five notes should have gone downward. As you listen to these last five tones, you teacher will point to the notes, holding a note where it should have been printed.

PIANO

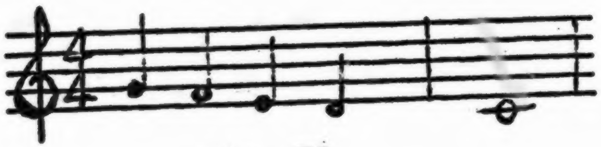


Fig. E3

(PROCTOR holds Panel 3 of Fig. E1 with right hand and pointer with left hand. PROCTOR points to each note as it is played. At the instant that the third last tone is played, PROCTOR holds Panel 3 of Fig. E1 directly under the third last note of Panel 1 of Fig. E1 circled previously, so that it appears as a bottom line note, E. PROCTOR continues to hold Panel 3 in place even after the five tones are played, but the pointer is removed.).

To make the correction properly, your teacher will use the empty staff beneath the sample tune. Instead of placing the note improperly as it was on the staff above, your teacher will place the note properly on the empty staff.

(PROCTOR replaces Panel 3 of Fig. E1 on Panel 1 of Fig. E1 using the empty staff of the latter so that Panel 3 appears as a bottom line note, E, directly below where the correction was made on the upper staff. Panel 3 is affixed at this time.).

Now we will do the Sample Problem on your test paper, page one. Find the Sample Problem at the top of the page. Point to each note with your finger and listen carefully as you hear the Sample Problem played on the piano. One of the notes in the Sample Problem is not printed correctly. You are to find that one error. To help you, the sample tune will be played on the piano three times. Be sure to follow each note with your finger as you hear the tune played, so you can find the one printed note-error. Pick up your pencils now, and have them ready to circle the error. Here is the Sample Problem tune:

(PIANO plays as in Fig. E2.).

Here is the Sample Problem tune again:

(PIANO plays as in Fig. E2.).

Here is the Sample Problem tune for the last time:

(PIANO plays as in Fig. E2.).

By this time you should have circled the error of the Sample Problem just as it was circled on the board. Now, take your pencil and correct that circled error on your paper by drawing the one note as it should be on the empty staff beneath the problem. Look at the board if you are not sure which note to draw.

(STOP THE TEST TAPE. Do not begin the tape again until you are sure that all pupils have finished drawing the note. The tape includes a pause of five seconds between the last word of the text previously heard, "...draw.", and the first word of the text which follows, "Put...". START THE TEST TAPE AGAIN.).

In the problems that follow, remember not to show in any way when you have found the error in pitch. Cover your paper so that others cannot see you marking it. As soon as you have found where the error is, remember to circle the one note that is not printed correctly. Watch the board please.

(PROCTOR steps to the right of the visual aid, Panel 1 of Fig. E1 with Panels 2 and 3 affixed as described above.).

If you make a mistake...

(PROCTOR replaces Panel 3 of Fig. E1 on Panel 1 of Fig. E1 so that Panel 3 appears as a middle line note, B, on the empty staff of Panel 1 of Fig. E1, directly above where Panel 3 was placed previously.).

...draw an "X" through the circle you made.

(PROCTOR affixes Panel 4 of Fig. E1 over Panel 3 of Fig. E1.).

Then make another circle around a different note of your choice.

(PROCTOR affixes Panel 5 of Fig. E1 to Panel 1 of Fig. E1 to the left of Panel 3 which is superimposed by Panel 4, so that Panel 5 appears as a bottom line note, E, on the same staff. Panel 6 of Fig. E1 is then affixed over Panel 5.).

Remember, too, that in each problem you are to try to correct the circled error by drawing the one note as it should be on the empty staff beneath each problem. If you make a mistake in drawing this corrected note, make an "X" through that note, and draw your correction some place else on the empty staff beneath the problem.

If there are any questions at this time, please ask your teacher.

(STOP THE TEST TAPE. PROCTOR states: "Before you ask your questions, let me add that you will hear each problem tune three times. You may find and correct the one note error in each problem as soon as you hear it. You will be given ten seconds after the third playing the tune before the next problem begins. If you have corrections to make, use an "X" mark to make your correction; do not use your eraser. Now I will answer any questions that you might have." PROCTOR answers questions, if any, put by PUPILS. Then PROCTOR states: "If there are no more questions, we will begin the test. Remember that in each problem you are to try to correct the circled error by drawing the one note as it should be on the empty staff beneath each problem. If you make a mistake in drawing this corrected note, make an "X" through that note, and draw your correction some place else on the empty staff beneath the problem. If you are not sure of an answer you may guess." START THE TEST TAPE AGAIN.).

Now find Problem One, underneath the Sample Problem you just did on page one of your test paper. In Problem One, you will hear the familiar tune, "Rock-a-bye Baby". Listen carefully now to the tune for Problem One:

PIANO

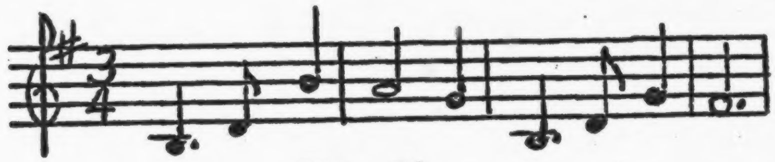


Fig. E4

Here is the tune for Problem One again:

(PIANO plays as in Fig. E4.).

Here is the tune for Problem One for the last time:

(PIANO plays as in Fig. E4.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem One.

(The tape includes a pause of ten seconds between Problems One and Two.).

Now find the notes for Problem Two.

In Problem Two, you will hear the familiar tune, "America the Beautiful". Listen carefully now to the tune for Problem Two:

PIANO

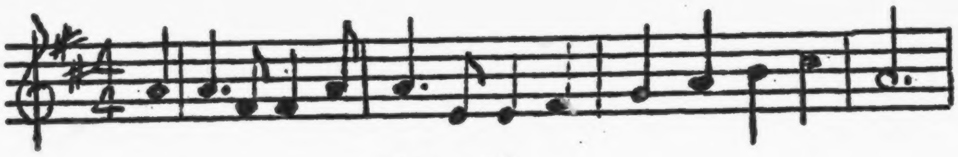


Fig. E5

Here is the tune for Problem Two again:

(PIANO plays as in Fig. E5.).

Here is the tune for Problem Two for the last time:

(PIANO plays as in Fig. E5.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Two.

(The tape includes a pause of ten seconds between Problem Two and the directions for turning the page.).

Now we have finished page one of the test. Turn your papers to page two.

(The tape includes a pause of four seconds to allow for turning the page.).

Find the notes for Problem Three at the top of the page. In Problem Three you will hear the familiar tune, "America", better known by its first words, "My country, 'tis of thee...". Listen carefully now to the tune for Problem Three:

PIANO

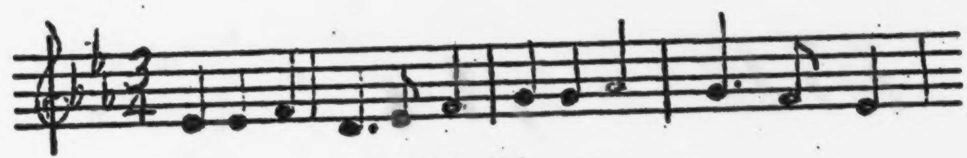


Fig. E6

Here is the tune for Problem Three again:

(PIANO plays as in Fig.E6.).

Here is the tune for Problem Three for the last time:

(PIANO plays as in Fig. E6.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Three.

(The tape includes a pause of ten seconds between Problems Three and Four.).

Now find the notes for Problem Four. You will hear the familiar tune, "Yankee Doodle". Listen carefully now to the tune for Problem Four:

**PIANO**

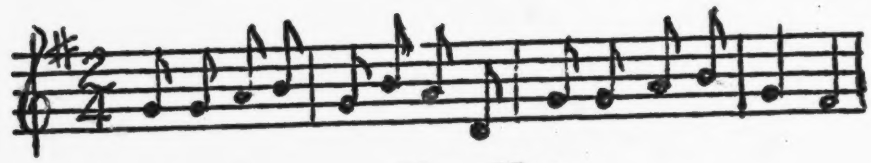


Fig. E7

Here is the tune for Problem Four again:

(PIANO plays as in Fig. E7.).

Here is the tune for Problem Four for the last time:

(PIANO plays as in Fig. E7.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Four.

(The tape includes a pause of ten seconds between Problems Four and Five.).

Now find the notes for Problem Five. You will hear the familiar tune, "Mary Had A Little Lamb". Listen carefully now to the tune for Problem Five:

**PIANO**

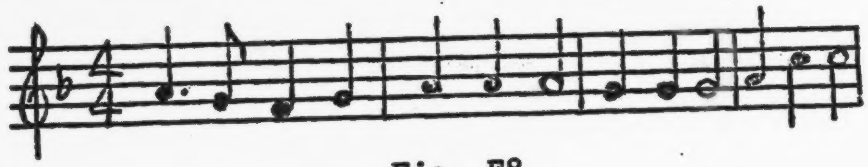


Fig. E8

Here is the tune for Problem Five again:

(PIANO plays as in Fig. E8.).

Here is the tune for Problem Five for the last time:

(PIANO plays as in Fig. E8.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Five.

(The tape includes a pause of ten seconds between Problems Five and Six.).

Now find the notes for Problem Six. You will hear the familiar tune, "The Star Spangled Banner", but do not stand! Listen carefully now to the tune for Problem Six:

PIANO

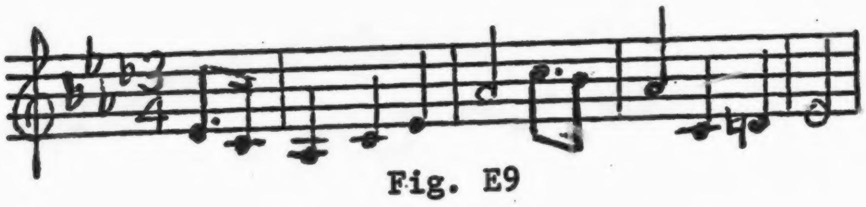


Fig. E9

Here is the tune for Problem Six again:

(PIANO plays as in Fig. E9.).

Here is the tune for Problem Six for the last time:

(PIANO plays as in Fig. E9.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Six.

(The tape includes a pause of ten seconds between Problem Six and the directions for turning the page.).

Now we have finished page two of the test. Turn your papers to page three.

(The tape includes a pause of four seconds to allow for turning the page.).

Find the notes for Problem Seven at the top of the page. In Problem Seven you will hear the familiar tune, "Three Blind Mice". Listen carefully now to the tune for Problem Seven:

PIANO

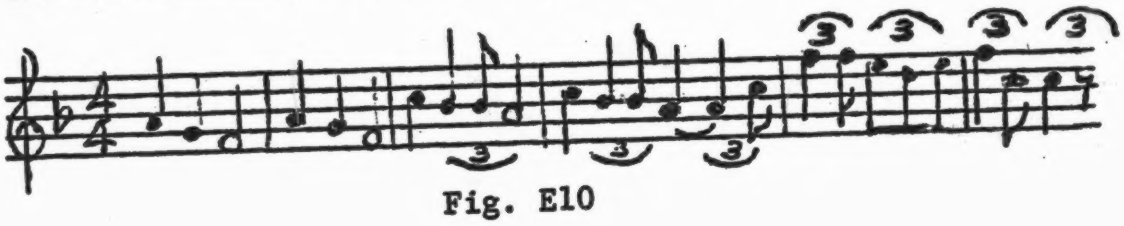


Fig. E10

Here is the tune for Problem Seven again:

(PIANO plays as in Fig.E10.).

Here is the tune for Problem Seven for the last time:

(PIANO plays as in Fig. E10.)

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Seven.

(The tape includes a pause of ten seconds between Problems Seven and Eight.).

Now find the notes for Problem Eight. You will hear the familiar tune, "The Marines Hymn". Listen carefully now to the tune for Problem Eight:

PIANO

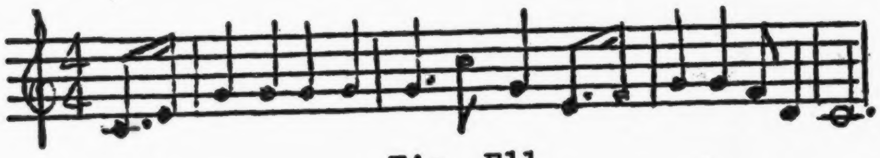


Fig. E11

Here is the tune for Problem Eight again:

(PIANO plays as in Fig. E11.).

Here is the tune for Problem Eight for the last time:

(PIANO plays as in Fig. E11.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Eight.

(The tape includes a pause of ten seconds between Problems Eight and Nine.).

Now find the notes for Problem Nine. You will hear the familiar tune "Dixie". Listen carefully now to the tune for Problem Nine:

PIANO

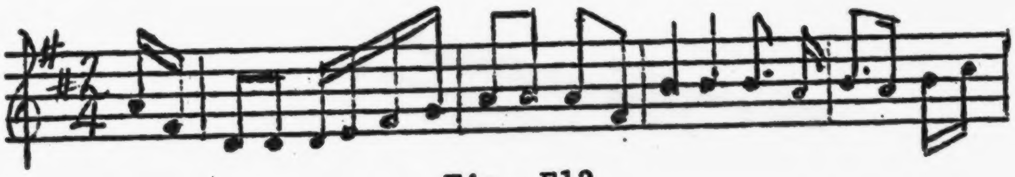


Fig. E12

Here is the tune for Problem Nine again:

(PIANO plays as in Fig. E12.).

Here is the tune for Problem Nine for the last time:

(PIANO plays as in Fig. E12.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Nine.

(The tape includes a pause of ten seconds between Problems Nine and Ten.).

Now find the notes for Problem Ten. You will hear the familiar tune, "Old Folks at Home", better known by its first words, "Way down upon the Swannee River...". Listen carefully now to the tune for Problem Ten:

PIANO

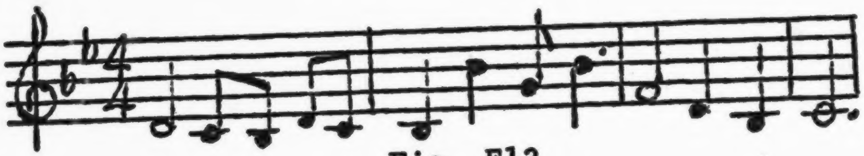


Fig. E13

Here is the tune for Problem Ten again:

(PIANO plays as in Fig. E13.).

Here is the tune for Problem Ten for the last time:

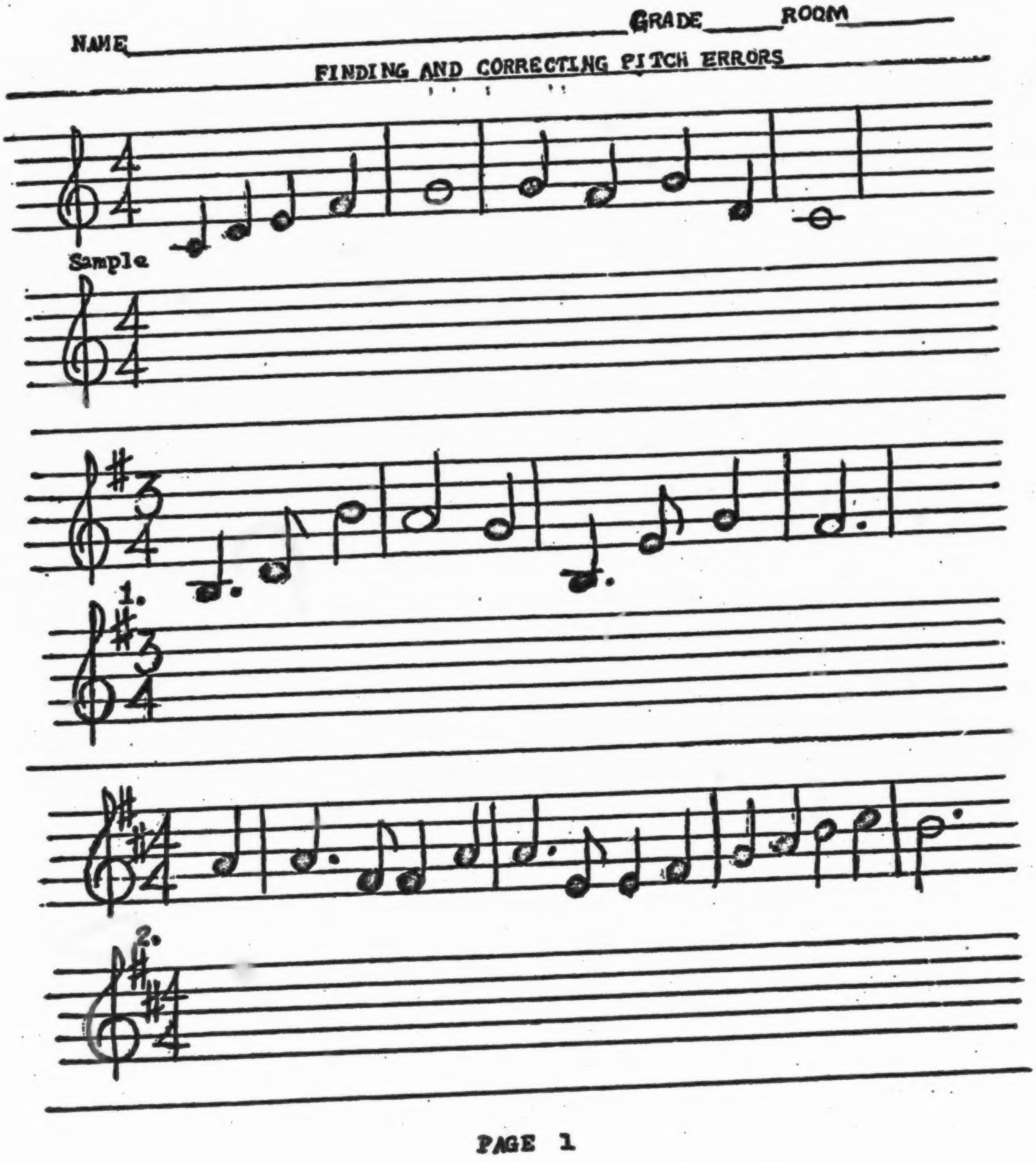
(PIANO plays as in Fig. E13.).

Circle the one error. Correct that error by drawing the one note as it should be on the empty staff beneath Problem Ten.

(The tape includes a pause of ten seconds between Problem Ten and the closing instructions.).

Put your pencils down. Turn the page so that page one is on top. This is the end of the test, "Finding and Correcting Pitch Errors". Listen to your teacher for further instructions.

(PROCTOR gives necessary instructions for collecting papers and for class dismissal.).

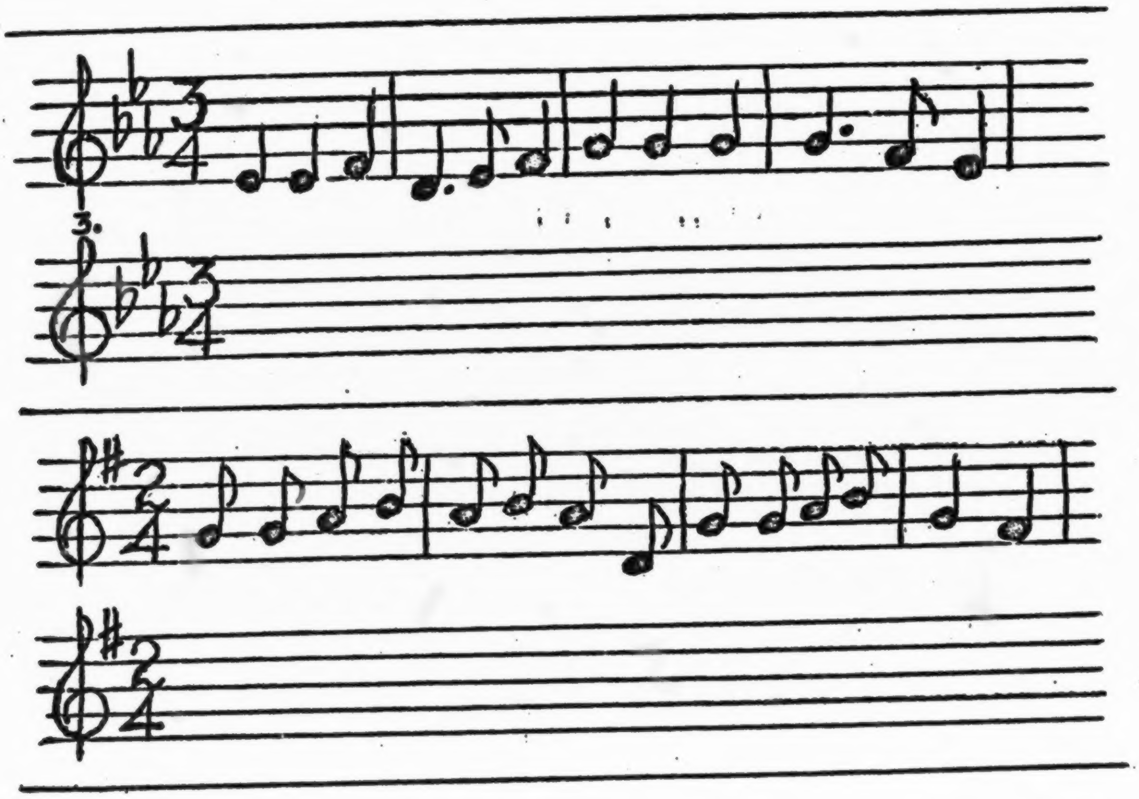


NAME______________________ GRADE_____ ROOM_______

FINDING AND CORRECTING PITCH ERRORS

PAGE 1

Fig. 14a.--Test of Discrimination of Pitch Errors and the Ability to Correct Them, Page One (Facsimile).



PAGE 2

Fig. 14b.--Test of Discrimination of Pitch Errors and the Ability to Correct Them, Page Two (Facsimile).

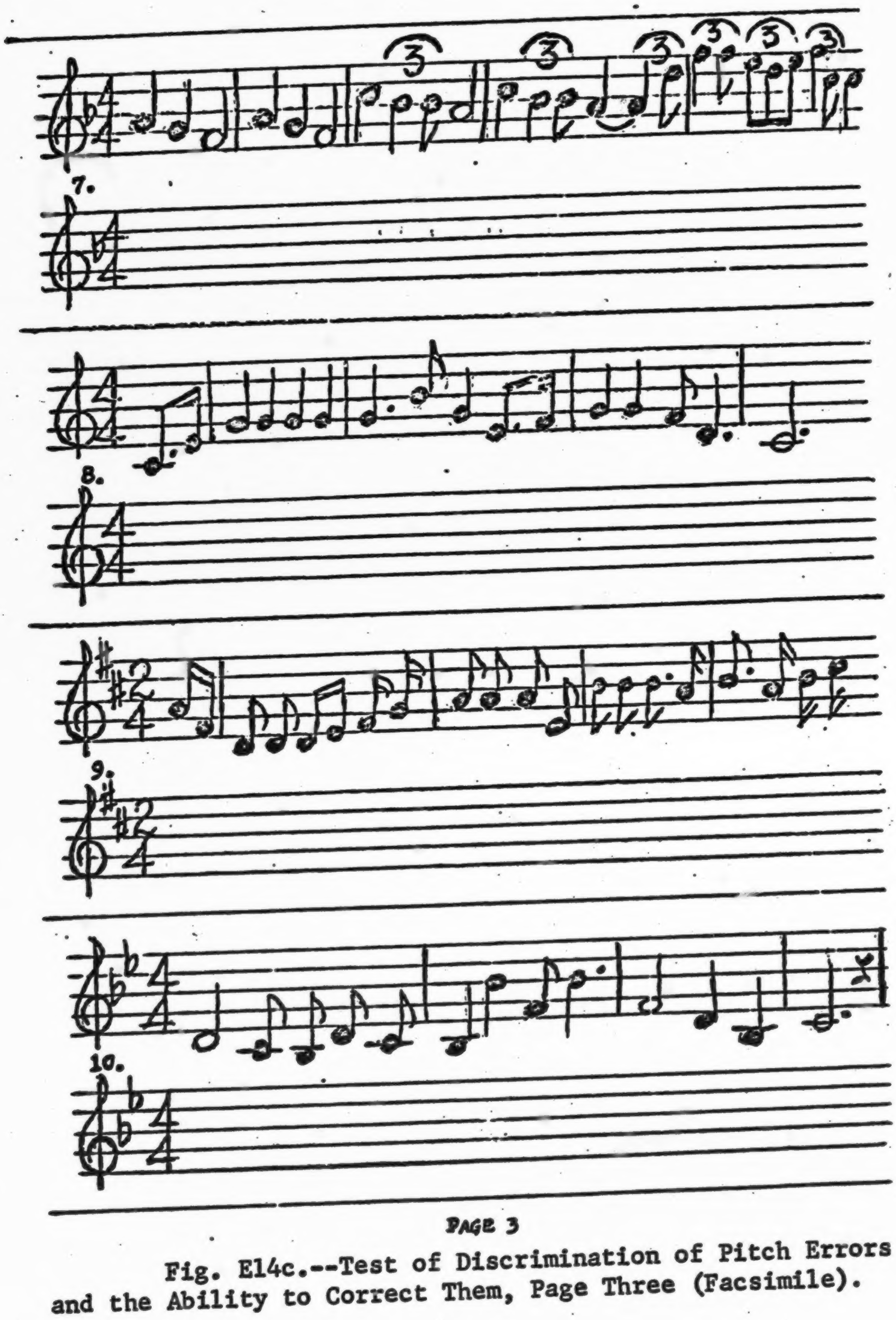
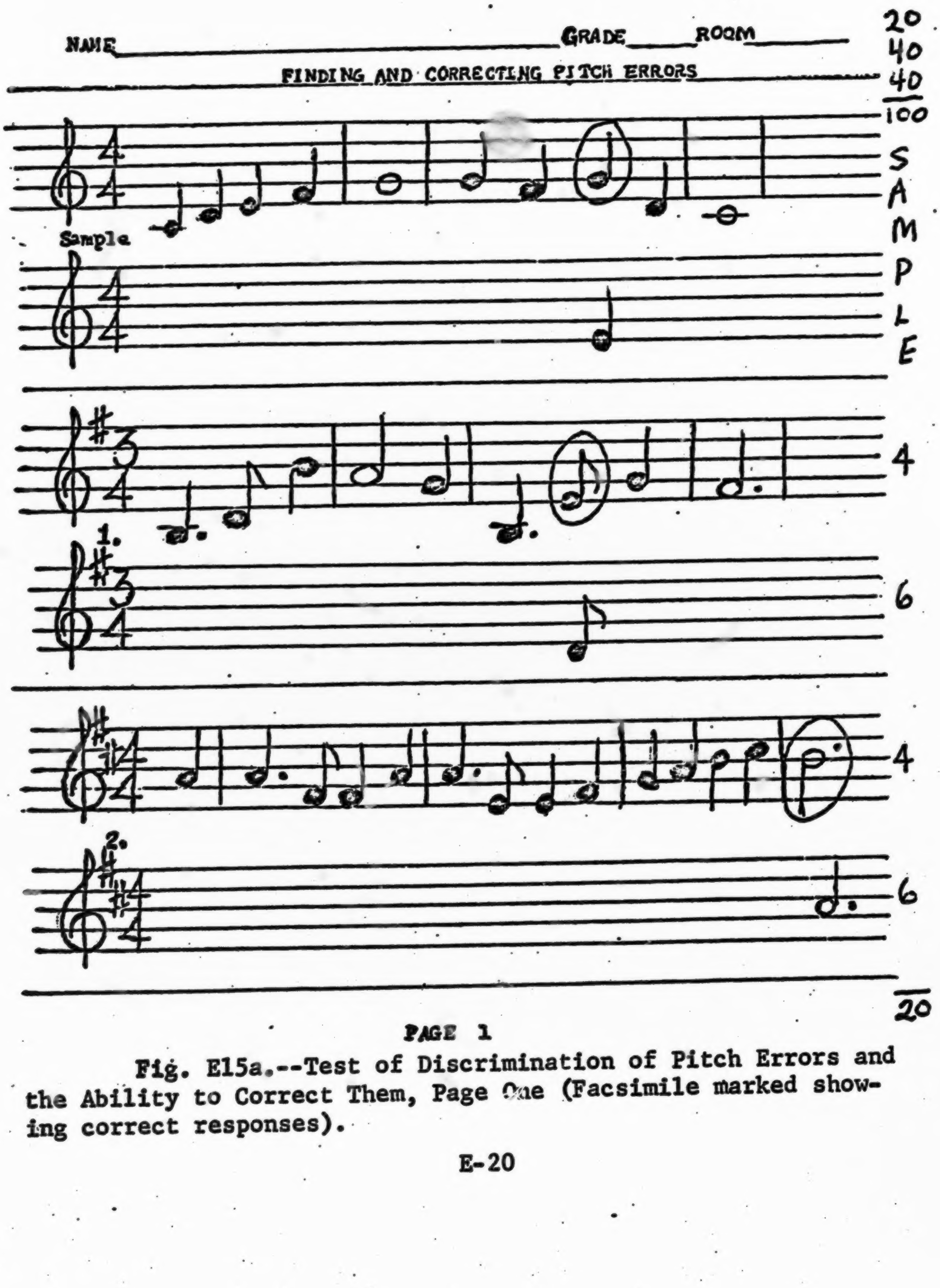

7.
8.
9.
10.
PAGE 3

Fig. E14c.--Test of Discrimination of Pitch Errors and the Ability to Correct Them, Page Three (Facsimile).

## D. Instructions for Scoring Test of Discrimination of Pitch Errors and the Ability to Correct Them

1. Follow the scoring procedure indicated in "2." (below) and score each page one of a group of tests, before following the same procedure for page two and page three. After scoring page one, total the points scored and enter the total in the lower right hand corner and in the upper right hand corner of page one. Then fold page one under page three, and score page two of each test. After scoring page two, total the points scored in the lower right hand corner of page two and in the upper right hand corner of page one (just under the page one total). Then fold page two under page one, and score page three of each test. After scoring page three, total the points scored in the lower right hand corner of page three and in the upper right hand corner of page one (just under the page one and page two totals). Then fold page three under page two, and add the three totals in the upper right hand corner of page one. The sum of the three totals thus obtained equals the "Percentage Score". Consult the Scoring Table (see Table X, page E-24) for the "Rank of Percentage Score".

2. Employ a red pencil to make a "4" in the right hand margin of each test page to the right of each staff with printed notes (except the sample problem on page one) on which staff the testee has circled the pitch error (see Fig. E15 for correctly circled responses). Ignore all "X" marks the testee made. Thus, if the testee pencilled an "X" over the correct response, the scorer will not make a "4" in the right hand margin; if the testee pencilled an "X" over an incorrect response, the scorer will make a "4" in the right hand margin only if the testee circled the pitch error. If two or more notes on the same printed note staff are circled by the testee, the scorer will not make a "4" in the right hand margin. Before scoring the circled pitch errors on another page, the scorer will first score the pitch error corrections on the same page just scored for pitch error circling. Employ a red pencil to make a "6" in the right hand margin of each test page to the right of each staff without printed notes (except the sample problem on page one) on which staff the testee has drawn the correct pitch error correction (see Fig. E15 for correctly drawn responses). Ignore all notes drawn over which the testee has made an "X". Thus, if the testee pencilled an "X" over a correctly drawn note, the scorer will not make a "6" in the right hand margin; if the testee pencilled an "X" over an incorrectly drawn note, the scorer will make a "6" in the right hand margin only if the testee also drew the correct pitch error correction. The testee is not restricted to placing the pitch error correction he draws directly under the circled



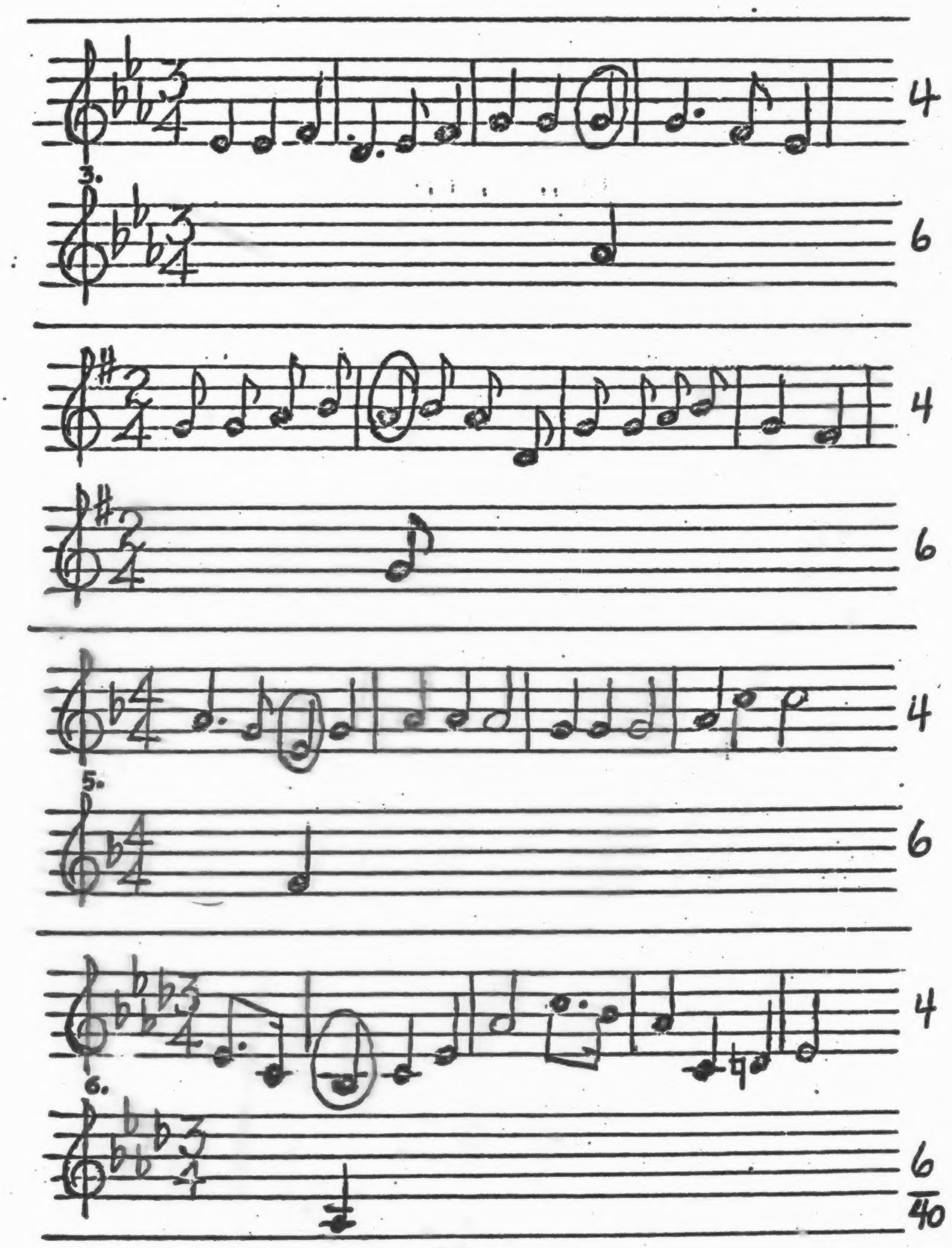
NAME____________________ GRADE____ ROOM______

FINDING AND CORRECTING PITCH ERRORS

20
40
40
100
Sample
S
A
M
P
L
E
1.
4
6
2.
4
6
20

PAGE 1

Fig. E15a.--Test of Discrimination of Pitch Errors and the Ability to Correct Them, Page One (Facsimile marked showing correct responses).



PAGE 2

Fig. E15b.--Test of Discrimination of Pitch Errors and the Ability to Correct Them, Page Two (Facsimile marked showing correct responses).

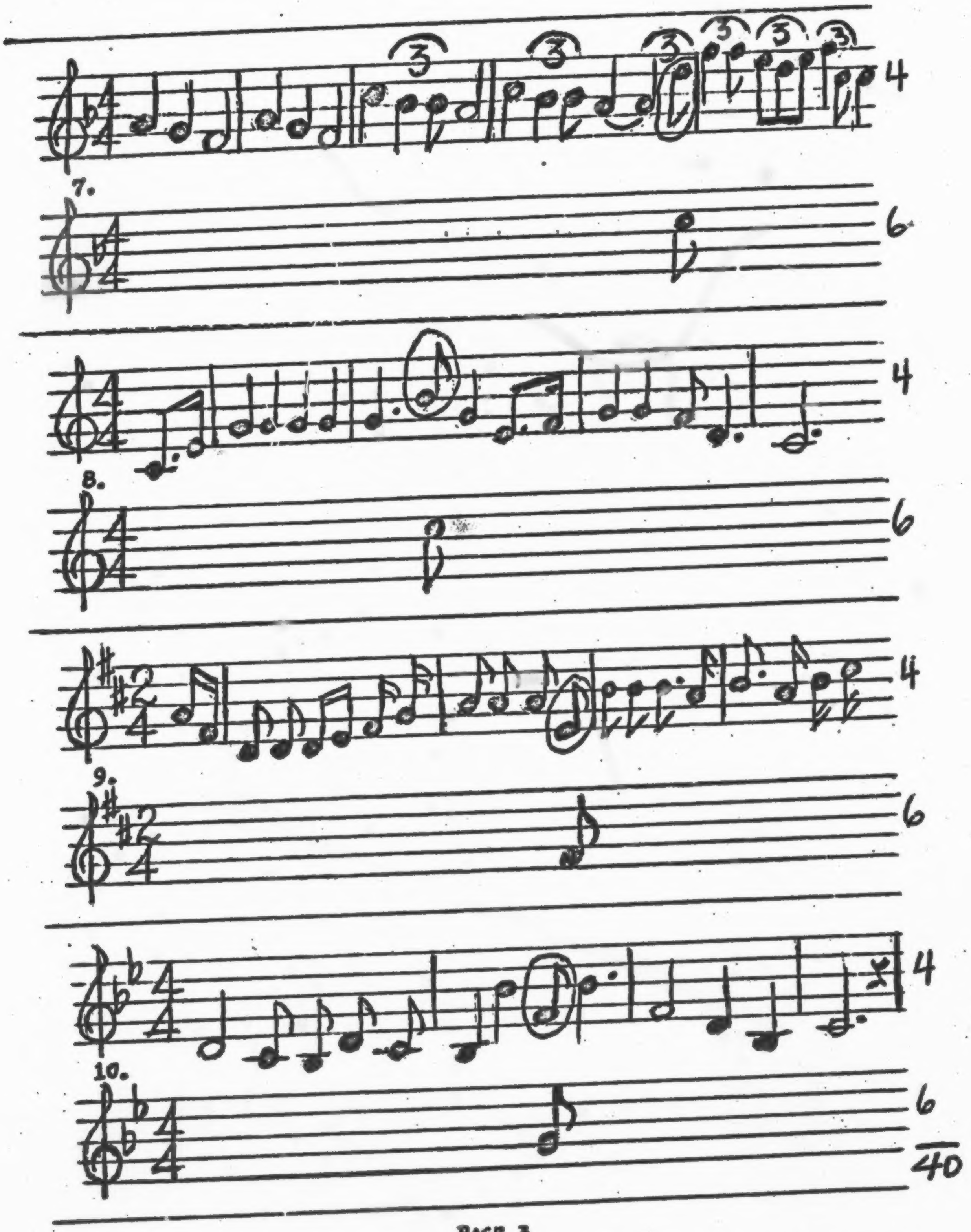

7.
4
6
8.
4
6
9.
4
6
10.
4
6
40
PAGE 3

Fig. E15c.--Test of Discrimination of Pitch Errors and the Ability to Correct Them, Page Three (Facsimile marked showing correct responses).

pitch error; the note may appear at any point on the staff without printed notes. The scorer must be alert to the following possibilities, which, if they occur, require that the scorer not make a "6" in the right hand margin:

a. If the testee has not circled the pitch error, no points are to be received for that problem, regardless of whether or not he draws the correct note on the staff without printed notes.

b. If the testee draws two or more notes on the staff without printed notes.

c. If the testee draws the corrected pitch error ambiguously (i.e., a note so large that it fills two or more spaces or a space note that extends beyond the lines above and/or below that space; or leger lines omitted or misplaced).

In scoring the notes on the staff without printed notes, the scorer will concern himself only with the head of the note; stems, flags, beams, and dots are irrelevant.

Employ a red pencil to enter the totals of the right hand margin figures on each page as explained in "1." (above).

---

This experimenter also entered the following information on each test paper:

1. The date of the test.

2. A test identification number. A number was assigned each test paper, numbering from the highest score in the lowest grade level to the lowest score in the highest grade level.

(The percentage score and Item 2 above were entered on each pupil's Data Sheet.).

## TABLE X

## TEST OF DISCRIMINATION OF PITCH ERRORS AND THE ABILITY TO CORRECT THEM SCORING TABLE

| Total Number of Errors in Pitch Found by Each Testee | Total Number of Errors in Pitch Corrected by Each Testee | Percentage Score | Rank of Percentage Score |
|---|---|---|---|
| 10 | 10 | 100 | 44 |
| 10 | 9 | 94 | 43 |
| 9 | 9 | 90 | 42 |
| 10 | 8 | 88 | 41 |
| 9 | 8 | 84 | 40 |
| 10 | 7 | 82 | 39 |
| 8 | 8 | 80 | 38 |
| 9 | 7 | 78 | 37 |
| 10 | 6 | 76 | 36 |
| 8 | 7 | 74 | 35 |
| 9 | 6 | 72 | 34 |
| 10 | 5 | 70 | 33 |
| 7 | 7 | 70 | 33 |
| 8 | 6 | 68 | 32 |
| 9 | 5 | 66 | 31 |
| 10 | 4 | 64 | 30 |
| 7 | 6 | 64 | 30 |
| 8 | 5 | 62 | 29 |
| 9 | 4 | 60 | 28 |
| 6 | 6 | 60 | 28 |
| 7 | 5 | 58 | 27 |

TABLE X—Continued.

| Total Number of Errors in Pitch Found by Each Testee | Total Number of Errors in Pitch Corrected by Each Testee | Percentage Score | Rank of Percentage Score |
|---|---|---|---|
| 8 | 4 | 56 | 26 |
| 9 | 3 | 54 | 25 |
| 6 | 5 | 54 | 25 |
| 10 | 2 | 52 | 24 |
| 7 | 4 | 52 | 24 |
| 8 | 3 | 50 | 23 |
| 5 | 5 | 50 | 23 |
| 9 | 2 | 48 | 22 |
| 6 | 4 | 48 | 22 |
| 10 | 1 | 46 | 21 |
| 7 | 3 | 46 | 21 |
| 8 | 2 | 44 | 20 |
| 5 | 4 | 44 | 20 |
| 9 | 1 | 42 | 19 |
| 6 | 3 | 42 | 19 |
| 10 | 0 | 40 | 18 |
| 7 | 2 | 40 | 18 |
| 4 | 4 | 40 | 18 |
| 8 | 1 | 38 | 17 |
| 5 | 3 | 38 | 17 |
| 9 | 0 | 36 | 16 |
| 6 | 2 | 36 | 16 |
| 7 | 1 | 34 | 15 |
| 4 | 3 | 34 | 15 |

TABLE X—Continued.

| Total Number of Errors in Pitch Found by Each Testee | Total Number of Errors in Pitch Corrected by Each Testee | Percentage Score | Rank of Percentage Score |
|---|---|---|---|
| 8 | 0 | 32 | 14 |
| 5 | 2 | 32 | 14 |
| 6 | 1 | 30 | 13 |
| 3 | 3 | 30 | 13 |
| 7 | 0 | 28 | 12 |
| 4 | 2 | 28 | 12 |
| 5 | 1 | 26 | 11 |
| 6 | 0 | 24 | 10 |
| 3 | 2 | 24 | 10 |
| 4 | 1 | 22 | 9 |
| 5 | 0 | 20 | 8 |
| 2 | 2 | 20 | 8 |
| 3 | 1 | 18 | 7 |
| 4 | 0 | 16 | 6 |
| 2 | 1 | 14 | 5 |
| 3 | 0 | 12 | 4 |
| 1 | 1 | 10 | 3 |
| 2 | 0 | 8 | 2 |
| 1 | 0 | 4 | 1 |
| 0 | 0 | 0 | 0 |

Notes: There are no possible combinations of Errors in Pitch Found and/or Errors in Pitch Corrected which would result in percentage scores of 98, 96, 92, 86, 6, or 2. "Rank of Percentage Score" used for ranking purposes.

## APPENDIX F. EXPERIMENTAL DESIGN DETAILS

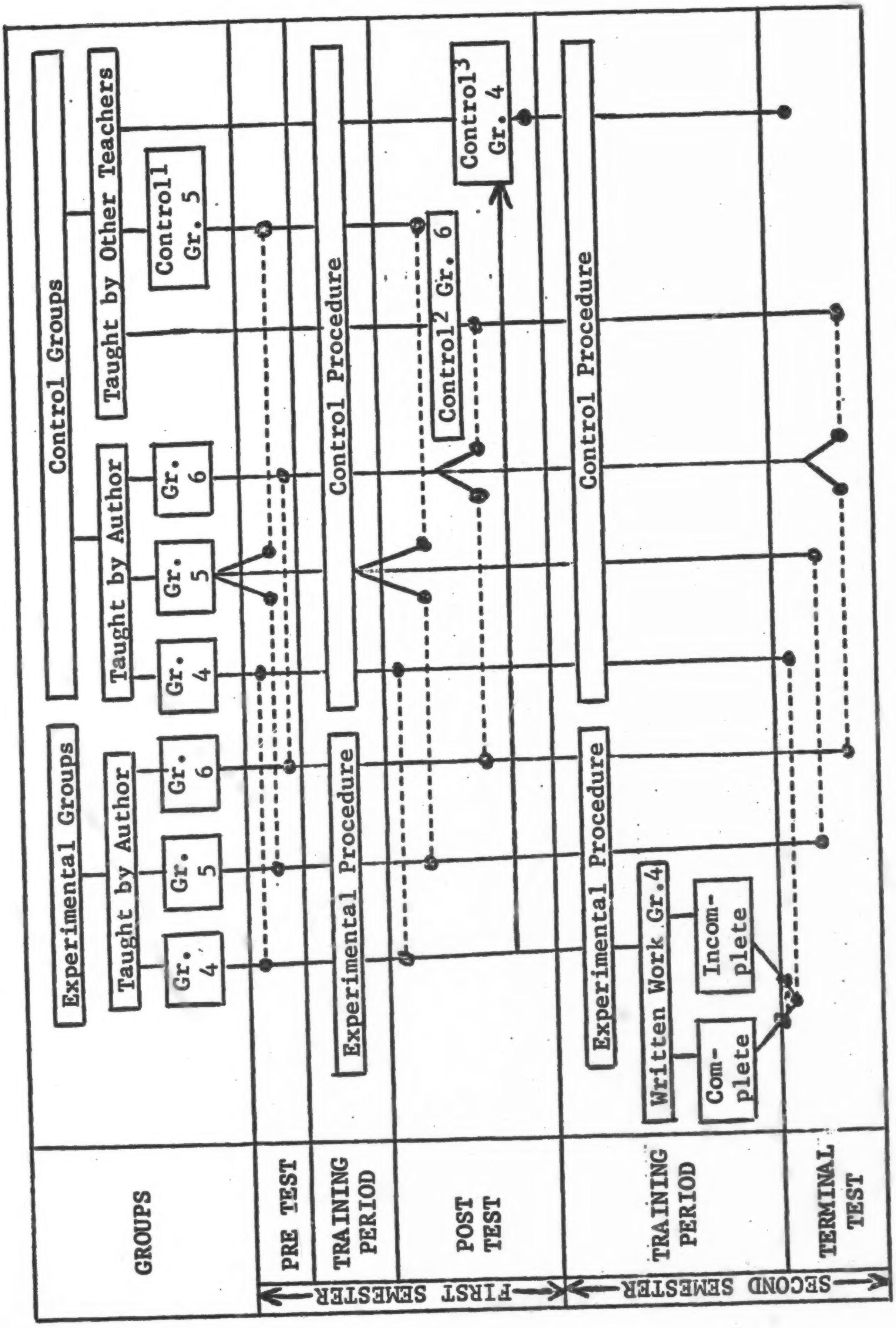

GROUPS
PRE TEST
TRAINING PERIOD
POST TEST
TRAINING PERIOD
TERMINAL TEST
FIRST SEMESTER
SECOND SEMESTER
Experimental Groups
Taught by Author
Gr. 4
Gr. 5
Gr. 6
Experimental Procedure
Experimental Procedure
Written Work Gr.4
Com-plete
Incom-plete
Control Groups
Taught by Author
Gr. 4
Gr. 5
Gr. 6
Taught by Other Teachers
Control$^{1}$ Gr. 5
Control$^{2}$ Gr. 6
Control$^{3}$ Gr. 4
Control Procedure
Control Procedure

Fig. F1.--Experimental Design, Area 1. Staff Knowledge.

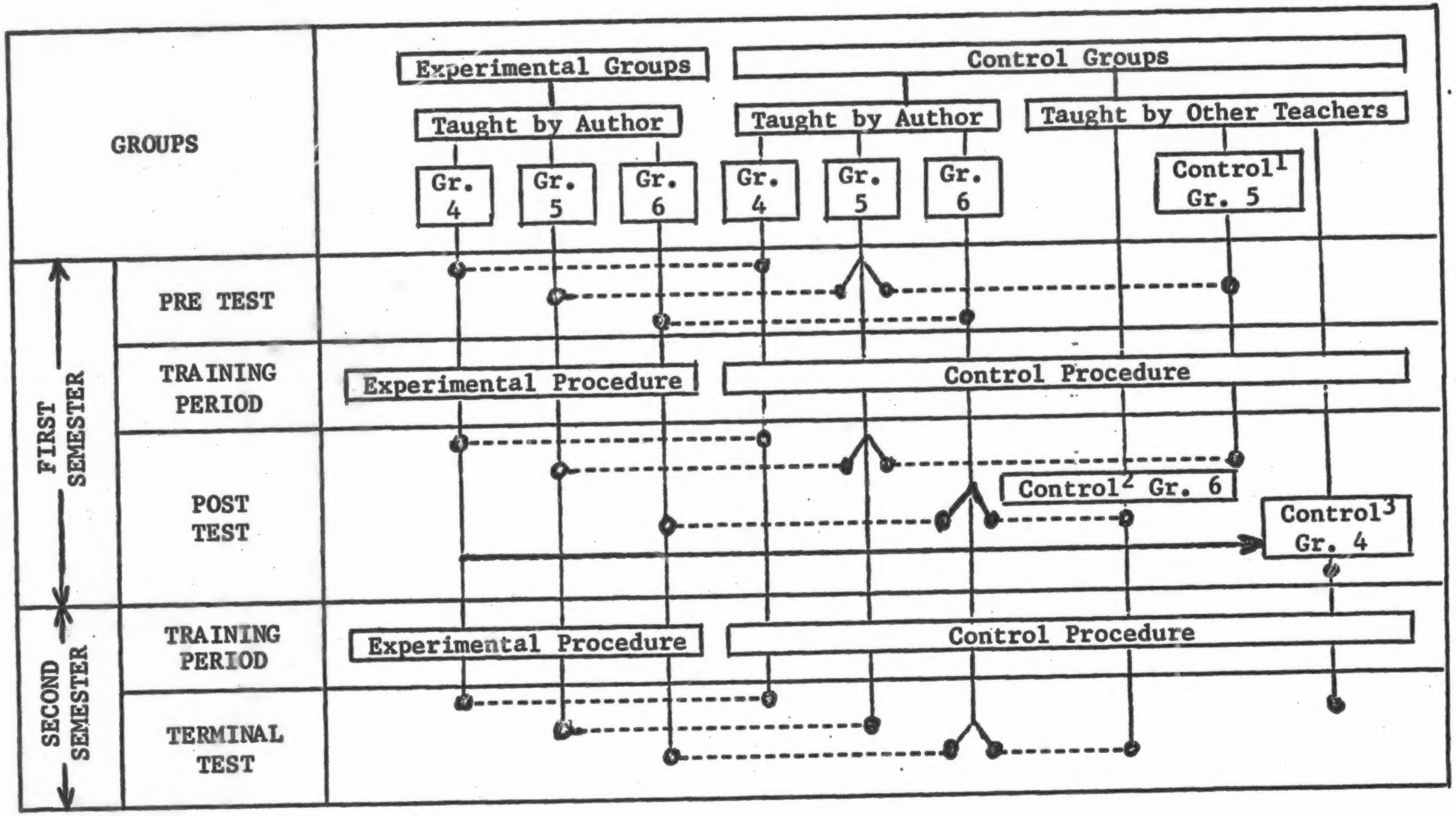

GROUPS
Experimental Groups
Control Groups
Taught by Author
Taught by Author
Taught by Other Teachers
Gr. 4
Gr. 5
Gr. 6
Gr. 4
Gr. 5
Gr. 6
Control$^1$ Gr. 5
FIRST SEMESTER
PRE TEST
TRAINING PERIOD
Experimental Procedure
Control Procedure
POST TEST
Control$^2$ Gr. 6
Control$^3$ Gr. 4
SECOND SEMESTER
TRAINING PERIOD
Experimental Procedure
Control Procedure
TERMINAL TEST

Fig. F2.--Experimental Design, Area 2. Knowledge of Fundamental Concepts of Tonal Organization.

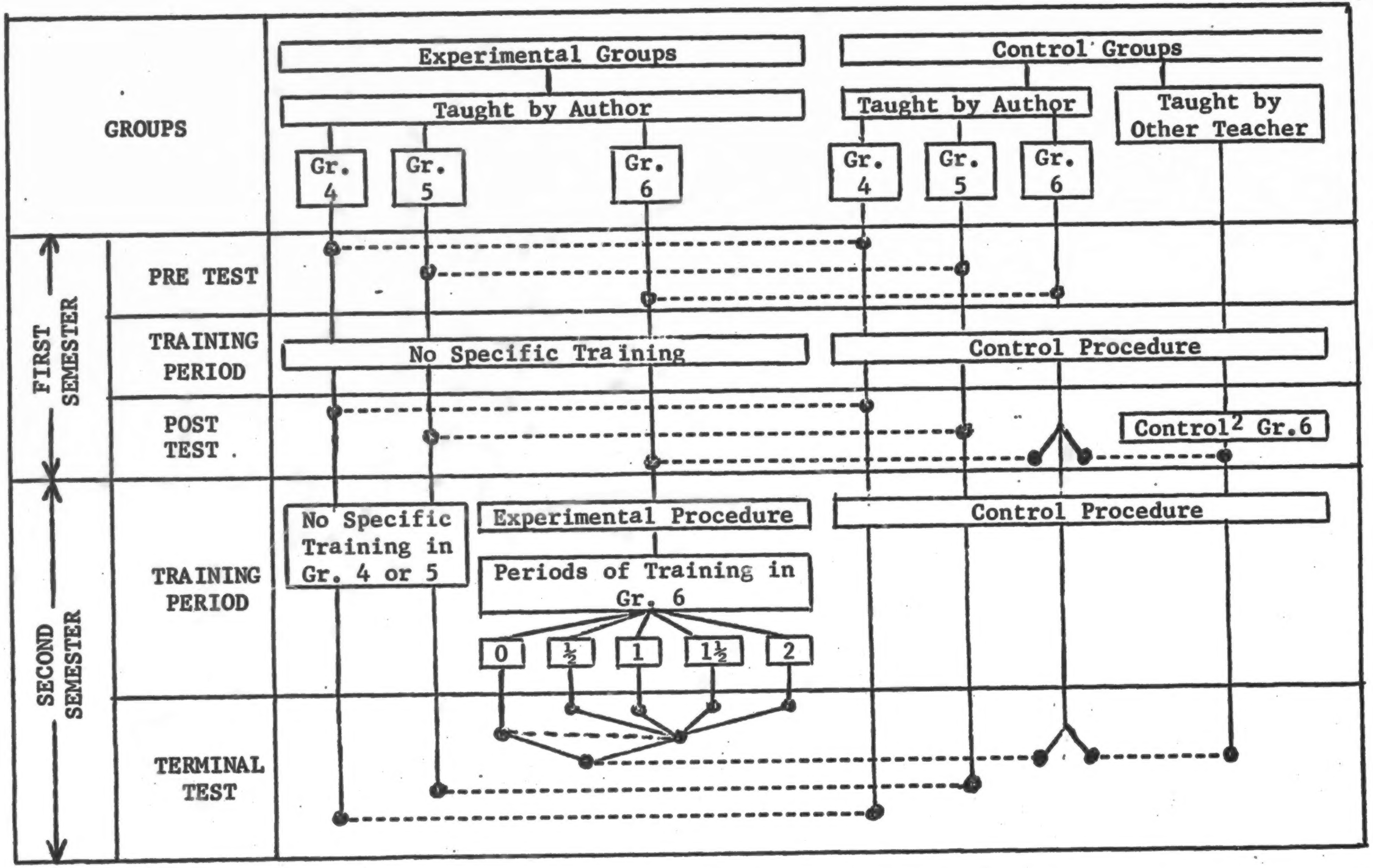

GROUPS
FIRST SEMESTER
PRE TEST
TRAINING PERIOD
POST TEST
SECOND SEMESTER
TRAINING PERIOD
TERMINAL TEST
Experimental Groups
Taught by Author
Gr. 4
Gr. 5
Gr. 6
Control Groups
Taught by Author
Gr. 4
Gr. 5
Gr. 6
Taught by Other Teacher
No Specific Training
Control Procedure
Control² Gr.6
No Specific Training in Gr. 4 or 5
Experimental Procedure
Periods of Training in Gr. 6
0
½
1
1½
2
Control Procedure

Fig. F3.--Experimental Design, Area 3. Rhythmic Discrimination.

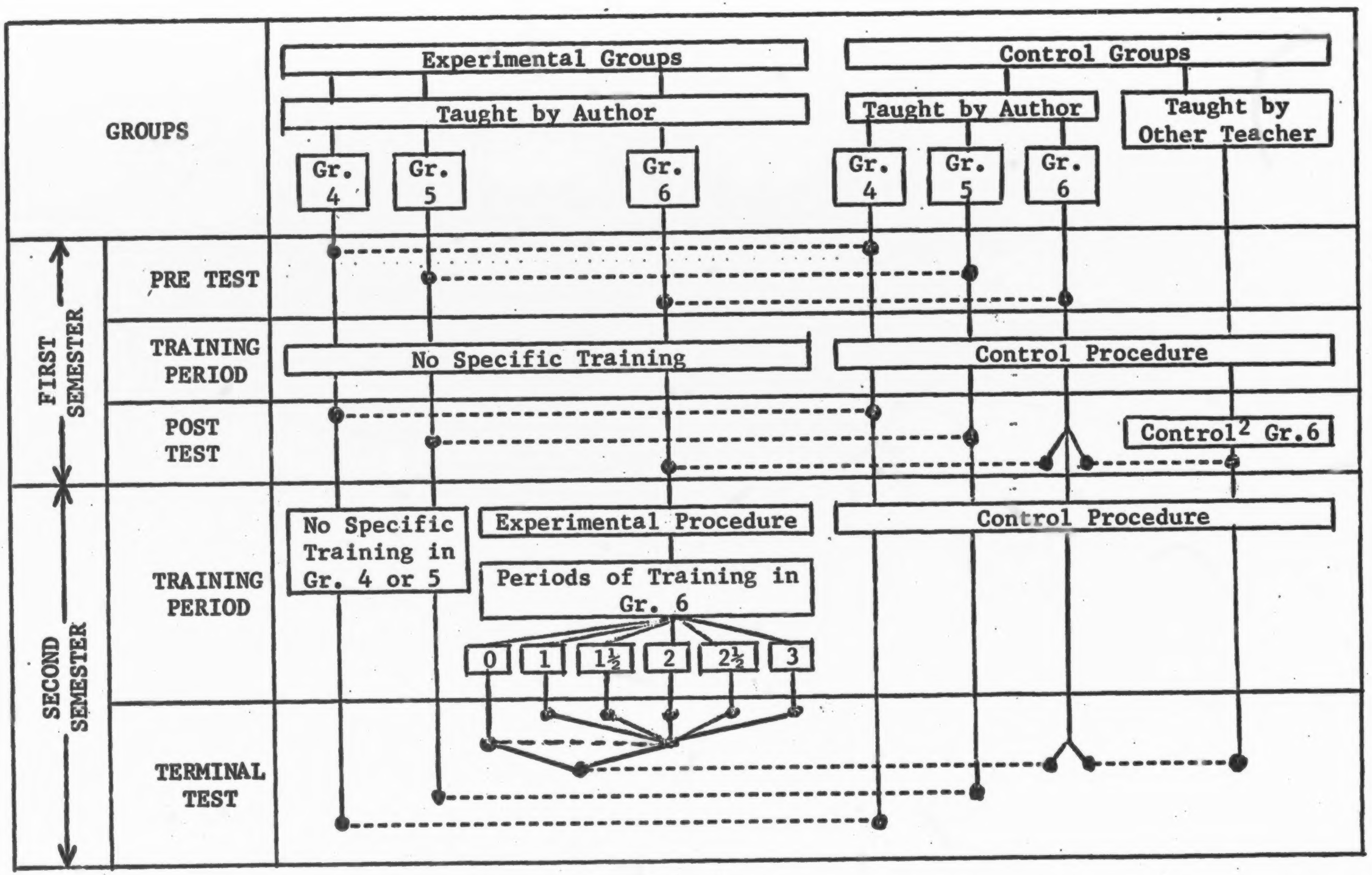

Experimental Groups
Control Groups
GROUPS
Taught by Author
Taught by Author
Taught by Other Teacher
Gr. 4
Gr. 5
Gr. 6
Gr. 4
Gr. 5
Gr. 6
FIRST SEMESTER
PRE TEST
TRAINING PERIOD
No Specific Training
Control Procedure
POST TEST
Control² Gr.6
SECOND SEMESTER
TRAINING PERIOD
No Specific Training in Gr. 4 or 5
Experimental Procedure
Control Procedure
Periods of Training in Gr. 6
0
1
1½
2
2½
3
TERMINAL TEST

Fig. F4.--Experimental Design, Area 4. Interval Recognition.

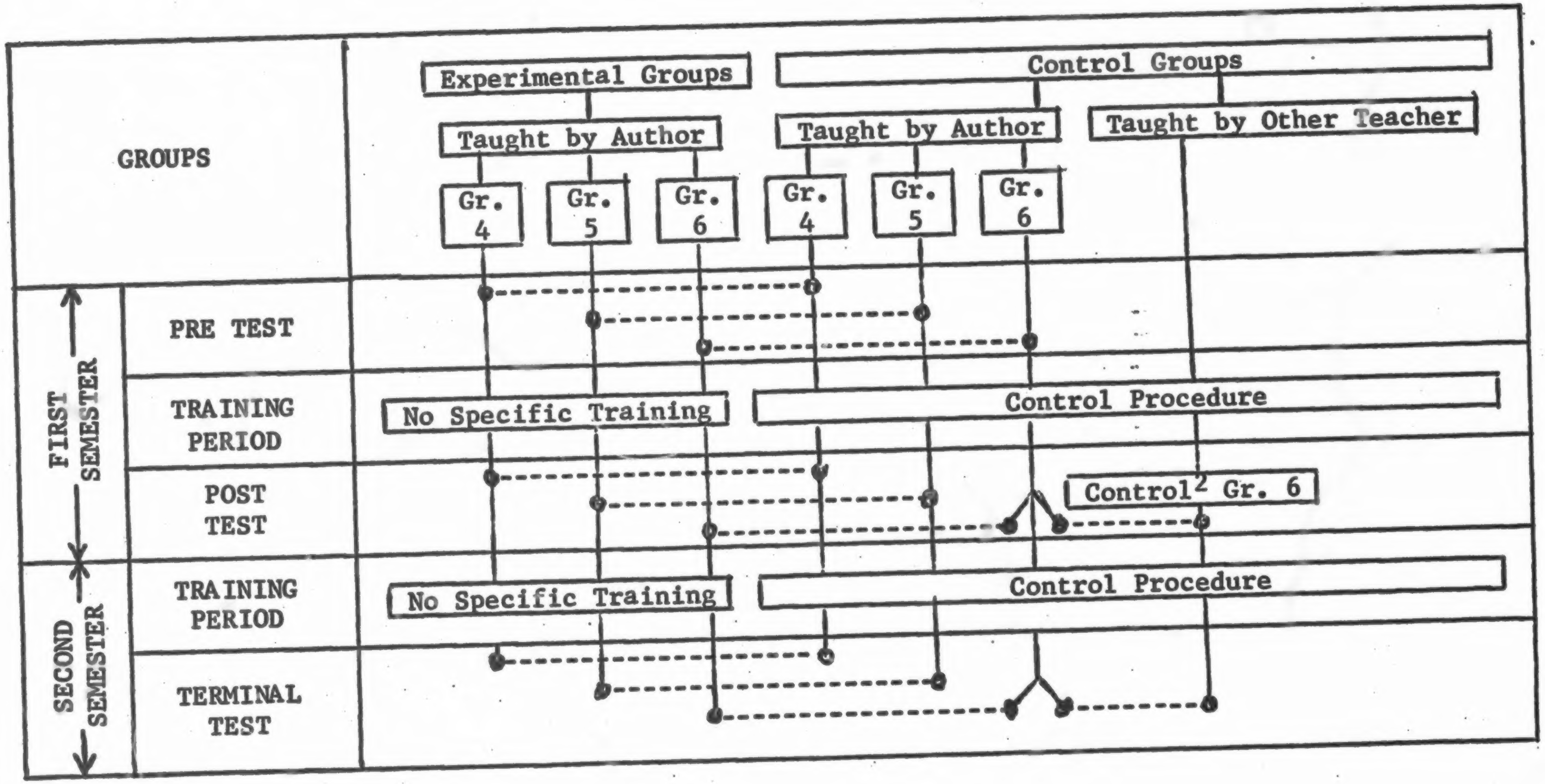

GROUPS
Experimental Groups
Control Groups
Taught by Author
Taught by Author
Taught by Other Teacher
Gr. 4
Gr. 5
Gr. 6
Gr. 4
Gr. 5
Gr. 6
FIRST SEMESTER
SECOND SEMESTER
PRE TEST
TRAINING PERIOD
POST TEST
TRAINING PERIOD
TERMINAL TEST
No Specific Training
Control Procedure
Control$^2$ Gr. 6
No Specific Training
Control Procedure

Fig. F5.--Experimental Design, Area 5. Discrimination of Pitch Errors and the Ability to Correct Them.

# APPENDIX G. SAMPLE SELECTION DETAILS

## TABLE XI

## DETAILS OF SELECTION OF JUDGMENT SAMPLE

| Category Number | Case Category Description | Number of Cases | | |
|---|---|---|---|---|
| | | Experimental School | Control School | Experimental & Control Schools Combined |
| 1 | Completed Pre, Post, & Terminal Tests in all areas . . . . . . . . . | 138. | 123 | 261 |
| 2 | Completed Pre and Post Tests in all areas, Terminal Tests in some areas . . . . . | 5 | 14 | 19 |
| 3 | Completed Pre and Post Tests in some areas, Terminal Tests in all areas . . . . . . . . . | 82 | 37 | 119 |
| 4 | Completed Pre, Post, & Terminal Tests in some areas . . . . . | 9 | 4 | 13 |
| 5 | Completed Pre and Post Tests in all areas, no Terminal Tests . . | 33 | 30 | 63 |
| 6 | Completed Pre and Post Tests in all areas, no Terminal Tests, & lack completion of written work in Area 1 during the first semester . . . . . . | 2 | . . | 2 |
| 7 | Completed Pre and Post Tests in some areas, no Terminal Tests . . | 27 | 11 | 38 |

TABLE XI—Continued.

| Category Number | Case Category Description | Number of Cases | | |
|---|---|---|---|---|
| | | Experimental School | Control School | Experimental & Control Schools Combined |
| 8 | Lack completion of written classwork in Area 2 or both Areas 1 and 2 during the first semester . . . | 22 | . . | 22 |
| 9 | Absent more than five class periods during the first semester . | 18 | 1 | 19 |
| 10 | Completed Pilot & Pre Tests in some areas, no Post or Terminal Tests . . . . . . . . | 45 | 12 | 57 |
| 11 | Lack Pre Tests in any area, or lack all tests . . . . . . . . | 173 | 40 | 213 |
| Less Category Nos. 8, 9, 10, & 11 containing cases that were irrelevant except for tests of reliability . . . . . . . . . . | | -258 | -54 | -312 |
| Total number of pupil cases selected for judgment sample . . | | 296 | 218 | 514 |

## TABLE XII

## SUMMARY OF TESTS COMPLETED BY PUPILS SELECTED FOR JUDGMENT SAMPLE

| Test Area | Experimental School | Control School | Experimental and Control Schools Combined |
|---|---|---|---|
| Completed Pre and Post Tests | | | |
| 1 | 233[a] | 198 | 431 |
| 2 | 259[b] | 207 | 466 |
| 3 | 254[c] | 203 | 457 |
| 4 | 242[d] | 205 | 447 |
| 5 | 255[e] | 208 | 463 |
| Completed Terminal Tests | | | |
| 1 | 186[f] | 159 | 345 |
| 2 | 205[g] | 159 | 364 |
| 3 | 207[h] | 164 | 371 |
| 4 | 195[i] | 165 | 360 |
| 5 | 195[j] | 167 | 362 |

[a] 223 of these pupils form the experimental groups; the remaining 10 pupils from the experimental school (control[1] pupils) were added to the 198 control school pupils to form a total of 208 control group pupils.

[b] 256 of these pupils form the experimental groups; the remaining 3 pupils from the experimental school (control[1] pupils) were added to the 207 control school pupils to form a total of 210 control group pupils.

[c] 251 of these pupils form the experimental groups; the remaining 3 pupils from the experimental school (control[1] pupils) were added to the 203 control school pupils to form a total of 206 control group pupils.

[d] 239 of these pupils form the experimental groups; the remaining 3 pupils from the experimental school (control[1] pupils) were added to the 205 control school pupils to form a total of

TABLE XII—Continued.

Notes (continued):

208 control group pupils.

[e]252 of these pupils form the experimental groups; the remaining 3 pupils from the experimental school (control[1] pupils) were added to the 208 control school pupils to form a total of 211 control group pupils.

[f]151 of these pupils form experimental groups; of the remaining 35 pupils, 25 receive experimental training only during the first semester (22 of these cases are Grade 4 pupils and become the control[3] group), and 10 are unusable cases, since these pupils only began experimental training the second semester.

[g]165 of these pupils form experimental groups; of the remaining 40 pupils, 37 receive experimental training only during the first semester (33 of these cases are Grade 4 pupils and become the control[3] group), and 3 are unusable cases, since these pupils only began experimental training the second semester.

[h]170 of these pupils form experimental groups; of the remaining 37 pupils, 34 receive experimental training only during the first semester, but not in this area, and 3 are unusable cases, since these pupils only began experimental training the second semester.

[i]159 of these pupils form experimental groups; of the remaining 36 pupils, 33 receive experimental training only during the first semester, but not in this area, and 3 are unusable cases, since these pupils only began experimental training the second semester.

[j]158 of these pupils form experimental groups; of the remaining 37 pupils, 34 receive experimental training only during the first semester, but not in this area, and 3 are unusable cases, since these pupils only began experimental training the second semester.

# APPENDIX H. PROGRAMMED LEARNING

Move the mask down to reveal the correct response and expose the next frame.

## EXPLORING THE KEYBOARD

| | |
|---|---|
| 1. Fold Panel I at Line A. Refer to Top Portion only for Frames 2 through 8. Go on to the next frame. | 1. After you have answered Frame 2, move the mask down; the correct answer will be in this box. |
| 2. A keyboard is made up of black and white keys. There are two kinds of keys: a)___ and b)___. | 2. a) black<br>b) white<br>or<br>a) white<br>b) black |
| 3. On the keyboard shown there are 24 keys. Of these, a)___ are white keys, but only b)___ are black keys. | 3. a) 14<br>b) 10 |
| 4. There are fewer black keys than white keys. That is because in some places two white keys are found with no black key separating them. Go on to the next frame. | 4. Go on to the next frame. |

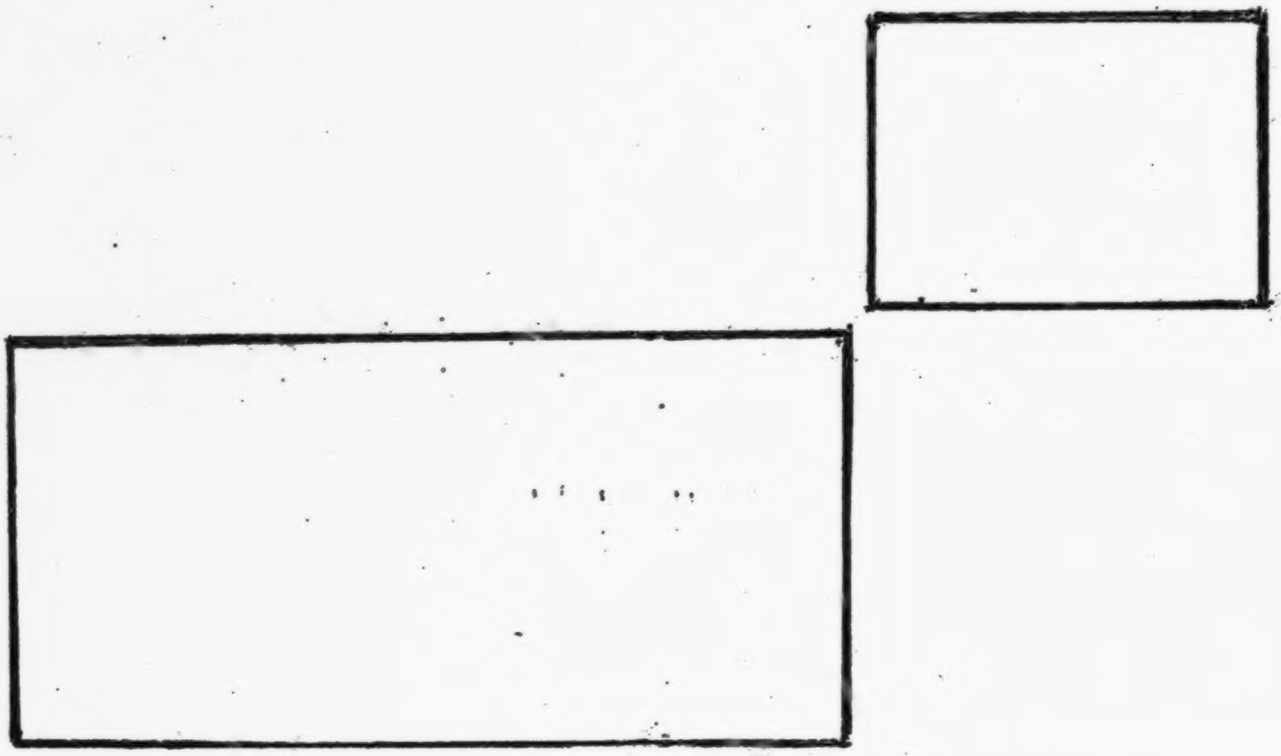
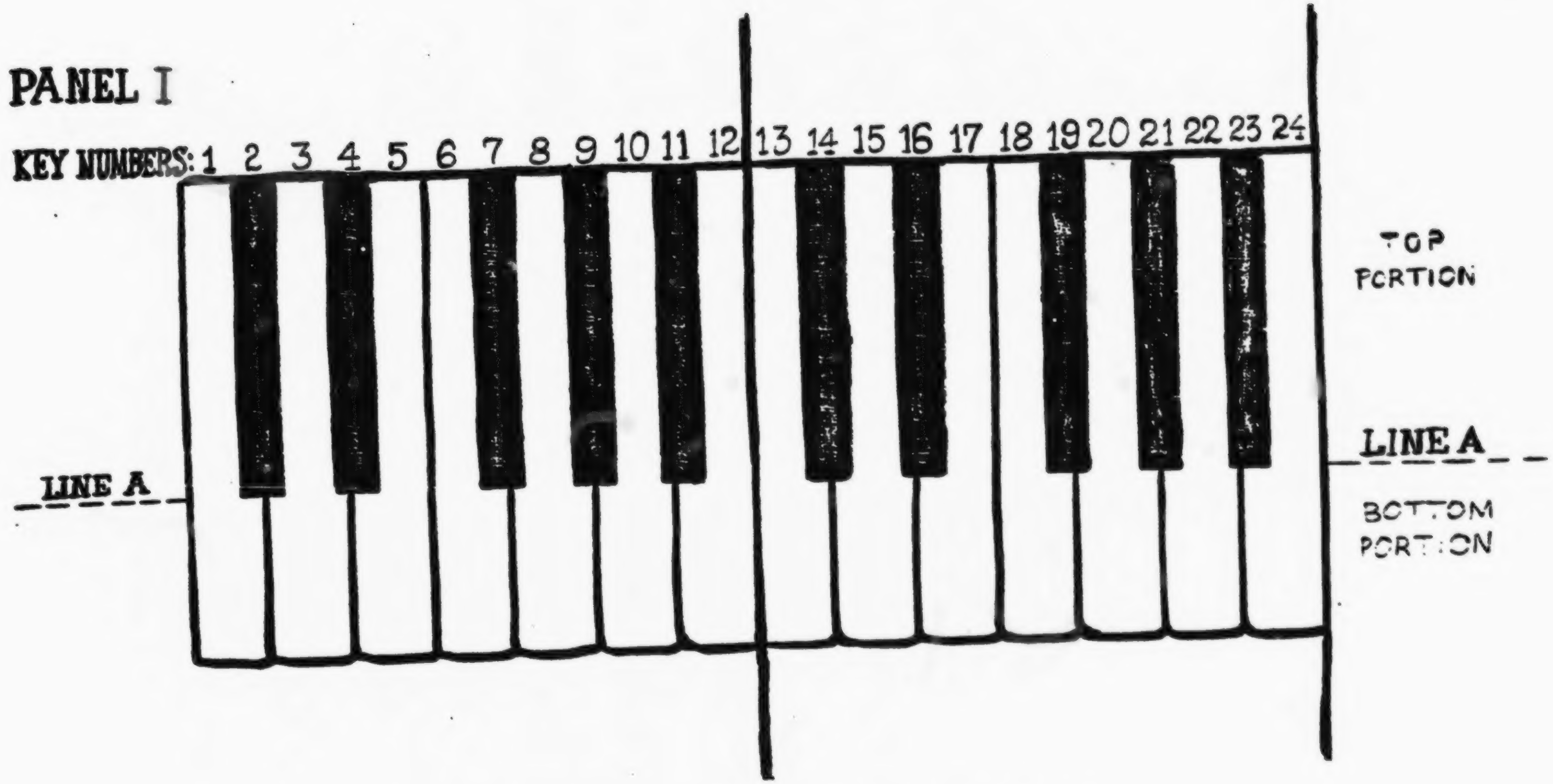


Fig. H1.--Mask for Programmed Learning

INSTRUCTIONS FOR USING MASK

Remove this page by cutting along the vertical line in the left margin. Also cut out the two rectangles above. Then place the mask thus formed over Page 1 of the Programmed Learning so that the title, "Exploring the Keyboard", and Frame 1 (stimulus) appear framed within the larger rectangle above. (Keep the right hand edge of the mask flush with the right hand edge of the Programmed Learning page.)


PANEL I
KEY NUMBERS: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
LINE A
TOP PORTION
LINE A
BOTTOM PORTION

(Reduced from standard keyboard size.)

Fig. H2.--Paper keyboard with numbered keys (Panel I).

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 2

After completing Frame 7, the pupils proceed to the piano by rows to play a black key group of two. Each pupil is asked to play a black key group of two that differs from the group played by the preceding pupil. Pupils who do not play correctly are asked to stand by the piano and observe others until they understand. When the entire class has played, the pupils who did not understand at first are given as many opportunities as are necessary for them to play correctly. Meanwhile, the pupils at their seats are directed to find black key groups of three on Panel I.

After Frame 8, the drill by rows (as described above) was repeated for locating black key groups of three.

Page 2

Move the mask down to reveal the correct response and expose the next frame.

5. Key numbers 5 and 6 are one example of two white keys with no black key between. Other examples: key numbers a)___ and b)___; c)___ and d)___.

5. a) 12 or 17
b) 13 18

c) 17 or 12
d) 18 13

6. These sets of two white keys with no black keys between separate the black keys into groups. Some of these black key groups have two black keys; others have three black keys. Altogether, on the keyboard shown, there are ___ black key groups.

6. four

7. Key numbers 2 and 4 form a black key group of two. Another black key group of two is formed by key numbers a)___ and b)___.

7. a) 14
b) 16

8. Key numbers 7, 9, and 11 form a black key group of three. Another black key group of three is formed by key numbers a)___, b)___, and c)___.

8. a) 19
b) 21
c) 23

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 3

The teacher uses a sample Panel I as a visual aid to demonstrate the procedure of Frame 9, and to supplement the instruction of Frames 10 and 11.

For Frame 12, the teacher plays a slow descending left hand glissando and shows the visual aid: **L** EFT
OWER

**Page 3**

**Move the mask down to reveal the correct response and expose the next frame.**

| | |
|---|---|
| 9. Unfold Panel I at Line A. Refer to both Top and Bottom Portions beginning with Frame 10.<br>Go on to the next frame. | 9. Go on to the next frame. |
| 10. Notice that the white keys are longer than the black keys. Notice the thin black lines between the white keys which represent small air spaces between the keys.<br>Go on to the next frame. | 10. Go on to the next frame. |
| 11. If we look at only the Bottom Portion of Panel I, it might seem as if key numbers 1 and 3 are separated only by the thin black lines (or "crack"). However, a glance at the Top Portion of Panel I reminds us that key numbers 1 and 3 are separated by a ___ ___. | 11. black key |
| 12. As we play to the left, each key that is pressed will lower the sound. This is easy to remember, since both "left" and "lower" begin with the letter, "___". | 12. "l" |

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 4

For Frame 13, the teacher plays a slow ascending right hand glissando and shows the visual aid:
RIGHT
RAISE

Before Frame 14 is attempted, the teacher chooses one pupil to play each white key from the left end to the right end of the keyboard, as the teacher and class repeatedly sing (in the middle register) from "a" through "g" using the syllable "loo".

Before Frame 15 is attempted, another pupil is chosen to play each white key from the left end to the right end of the keyboard, as the teacher and class repeatedly sing (in the middle register) from "a" through "g" using the letters from "A" through "G".

For Frames 16 and 17, the teacher uses a sample Panel I as a visual aid to demonstrate the procedures of these two frames.

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | |
|---|---|
| 13. As we play to the right, each key that is pressed will raise the sound. This is easy to remember, since both "right" and "raise" begin with the letter, "___". | 13. "r" |
| 14. Beginning at the left (or low) end of a full-size piano keyboard of 88 white and black keys, the 52 white keys are named with the first seven letters of the alphabet:___,___,___,___,___,___,___. | 14. A,B,C,D,E,F,G |
| 15. The complete sets of seven letters are used seven times to name a total of a)___white keys; the remaining three white keys are named with three letters: b)___,___,___. | 15. a) 49<br>b) A,B,C |
| 16. We must be able to name each white key quickly. This would be hard to do, if we looked at just the white keys. Fold Panel I at Line A, and look at the Bottom Portion only. (Have the Top Portion face down on your desk.). All the white keys look___. | 16. alike<br>or<br>the same<br>or<br>like each other |

ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 5

Before Frame 18 is attempted, the teacher asks the class to say aloud letter names beginning with "A" as a chosen pupil plays only the first four white keys beginning at the left end of the piano. The chosen pupil is then asked to announce to the class whether or not the white key D thus located is found between a black key group of two.

After Frame 20, the drill by rows is repeated for locating "D" on the piano. Each pupil is asked to sing "d" as he plays it.

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | | |
|---|---|---|
| 17. | However, if we look at only the Top Portion of Panel I (with the Bottom Portion face down on your desk), it will be easy to name the white keys quickly, because each of the white keys is related to a a)___key group of two or to a b)___key group of three. | 17. a) black<br>b) black |
| 18. | On the full-size keyboard, if we begin at the left end and play the first four white keys, the fourth key will be the letter a)___, and it will always be found between the two black keys of a black key group of b)___. | 18. a) D<br>b) two |
| 19. | Key numbers 2 and 4 on Panel I form a black key group of two. The letter D will be found on key number___. | 19. 3 |
| 20. | Another D on Panel I is key number a)___, found between key numbers b)___ and c)___(which form a black key group of d)___). | 20. a) 15<br>b) 14<br>c) 16<br>d) two |

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 6

Before Frame 21 is attempted, the teacher asks the class to say aloud letter names beginning with "A" as a chosen pupil plays only the first eight keys beginning at the left end of the piano. The chosen pupil is then asked to announce to the class whether or not the seventh and eighth white keys, G and A, thus located are found on both sides of the middle black key of a black key group of three.

After Frame 23, the drill by rows is repeated for locating "G" and "A" on the piano. Each pupil is asked to sing the proper letter for each key as it is played.

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | |
|---|---|
| 21. On the full-size keyboard, if we begin at the left end and play the first eight white keys, the seventh and eighth keys will be the letters a)___ and b)___. These two white keys will be found on both sides of the middle black key of a black key group of c)___. | 21. a) G<br>b) A<br>c) three |
| 22. Key numbers 7, 9, and 11 on Panel I form a black key group of three. The middle black key of this black key group of three is key number a)___. The letters G and A will be on both sides of that key, on key numbers b)___ and c)___. | 22. a) 9<br>b) 8<br>c) 10 |
| 23. Another G and A can be found on Panel I on key numbers a)___ and b)___. The black key between them, key number c)___, is the middle black key of a black key group of d)___. | 23. a) 20<br>b) 22<br>c) 21<br>d) three |
| 24. In the alphabet, the letter before D is a)___. The letter after D is b)___. Key number 3 is D, so key number 1 will be c)___ and key number 5 will be d)___. | 24. a) C<br>b) E<br>c) C<br>d) E |

ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 7

After Frame 25, the drill by rows is repeated for locating "C" and "E" on the piano. Each pupil is asked to point to "D" with the pointer finger of one hand, play "C" and "E" with the pointer finger of the other hand, and sing the proper letter for each key as it is played.

After Frame 27, the drill by rows is repeated for locating "F" and "B" on the piano. Each pupil is asked to point to "G" and "A" with two fingers of one hand, play "F" and "B" with the pointer finger of the other hand, and sing the proper letter for each key as it is played.

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | |
|---|---|
| 25. The letter name of key number 15 is a)___. Key number 13's letter name is b)___. Key number 17's letter name is c)___. | 25. a) D<br>b) C<br>c) E |
| 26. In the alphabet, the letter before G is a)___. The letter after A is b)___. Key numbers 8 and 10 are G and A, so key number 6 will be c)___ and key number 12 will be d)___. | 26. a) F<br>b) B<br>c) F<br>d) B |
| 27. The letter names of key numbers 20 and 22 are a)___ and b)___. Key number 18's letter name is c)___ and key number 24's letter name is d)___. | 27. a) G<br>b) A<br>c) F<br>d) B |
| 28. Always remember: D is the white key between a black key group of two. All the other white key letters can be named by saying the alphabet. DEFGABCD, when playing to the right and DCBAGFED, when playing to the left.<br>Go on to the next frame. | 28. Go on to the next frame. |

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 8

Before attempting Frame 29, the class practises saying the alphabet backwards from "G". In subsequent lessons, pupils challenge each other in speed drills of this procedure. Pupils are also drilled to quickly respond to any given letter by supplying the "lower" letter (i.e., given "A", pupils respond: "G"). In addition, pupils are given extensive drill in this and subsequent lessons in finding any white key (given the letter name) both at their seats using Panel I (responding with key numbers) and at the piano (responding by playing the proper key). This drill is also reversed so that pupils name by letter any key number selected by another pupil or any key played on the piano by another pupil (visual, not aural, recognition).

For Frames 29, 30, and 31, the teacher uses a sample Panel II as a visual aid to demonstrate the procedures of these three frames.

After Frame 30, pupils are asked to name various white keys (given the key numbers) adding the word "natural" to the letter name.

Move the mask down to reveal the correct response and expose the next frame.

| | | | |
|---|---|---|---|
| 29. | Refer now to Panel II. Panel II shows the chromatic signs used in music. Used with the musical alphabet letters already learned, these chromatic signs will name the black keys and rename the white keys. Go on to the next frame. | 29. | Go on to the next frame. |
| 30. | Notice first the natural sign. It is used to name any white key. The white key D may also be correctly named "D Natural"; the white key A may also be correctly named "___ ___". | 30. | "A natural" |
| 31. | Now look at the sharp sign. Notice that the sharp will always be the nearest key to the right of any white key, although the sharp itself may be a black or a white key. Go on to the next frame. | 31. | Go on to the next frame. |
| 32. | Refer now to Panel I. The nearest key to the right of key number 3, D, is key number a)___, and it may be called "D sharp". Is D sharp a white key or a black key? b)___ ___ ___. | 32. | a) 4<br>b) A black key. |

# PANEL II

| CHROMATIC SIGNS | | | | |
|---|---|---|---|---|
| ♭♭ | ♭ | ♮ | ♯ | × |
| DOUBLE FLAT | FLAT | NATURAL | SHARP | DOUBLE SHARP |
| 2ND NEAREST KEY TO THE LEFT OF NATURAL | NEAREST KEY TO THE LEFT OF NATURAL | ANY WHITE KEY | NEAREST KEY TO THE RIGHT OF NATURAL | 2ND NEAREST KEY TO THE RIGHT OF NATURAL |
| BLACK OR WHITE | BLACK OR WHITE | WHITE ONLY | BLACK OR WHITE | BLACK OR WHITE |

Fig. H3.--Chromatic Signs (Panel II).

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | | |
|---|---|---|
| 33. | The nearest key to the right of key number 5, E natural, is key number a)___, and it may be called "E sharp". Is E sharp a white key or a black key? b)___ ___ ___. | 33. a) 6<br>b) A white key. |
| 34. | Sometimes the white key number 6 will be called "E sharp"; sometimes it will be called by its natural name, ___. | 34. F |
| 35. | Don't be surprised to find that keys have more than one name! Often a boy named "William" is called "Bill". People often have more than one name, too, you see. Go on to the next frame. | 35. Go on to the next frame. |
| 36. | Call key number 6 "F natural" now. Key number 7 will be ___ ___. | 36. F sharp |

# ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 10

After Frame 40, pupils are drilled in finding the sharps of various letters, by responding at their seats with the proper key number or at the piano by playing the proper key.

Page 10

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | |
|---|---|
| 37. Key number 8 is a)___ natural; therefore the nearest key to the right, key number 9, is the black key which may be called b)___ ___. | 37. a) G<br>b) G sharp |
| 38. If key number 10 is A natural, then key number 11 may be called ___ ___. | 38. A sharp |
| 39. Key number 12 is B natural. Key number 13 may be called "B sharp" because it is the a)___ key to the right of B natural. Another name for key number 13 is b)___ ___. | 39. a) nearest<br>b) C natural<br>or<br>C |
| 40. Key number 14 may be called "C sharp" because it is the nearest key to the ___ of the white key C (or C natural). | 40. right |

Move the mask down to reveal the correct response and expose the next frame.

| | | | |
|---|---|---|---|
| 41. | Refer now to Panel II. Look at the flat sign. Notice that the flat will always be the nearest key to the left of any white key, although the flat itself may be a black or white key. | 41. | Go on to the next frame. |
| 42. | Refer now to Panel I. The nearest key to the left of key number 15, D, is the black key, key number 14, which may be called "D flat". Since key number 14 is also the nearest key to the right of key number 13, C, key number 14 may also be called___ ___. | 42. | C sharp |
| 43. | You must now realize that black keys, too, can have more than one name. Every black key has a sharp name and a ___ name. | 43. | flat |
| 44. | The nearest key to the left of key number 13, C, is the white key, key number 12, which may be called "C flat". Since key number 12 is a white key, it also has a natural name:___. | 44. | B<br>or<br>B natural |

Move the mask
down to reveal the
correct response
and expose the
next frame.

45. The nearest key to the left of key number 12, B a)___, is the black key, key number 11, which may be called b) "___flat" or c) "___ sharp".

45. a) natural
b) B
c) A

46. The nearest key to the left of key number 10, a)___ natural, is the black key, key number 9, which may be called "A b)___" or "G c)___".

46. a) A
b) flat
c) sharp

47. The nearest key to the left of key number 8, G natural, is key number a)___ which may be called b)"___ ___" or c)"___ ___".

47. a) 7
b) G flat
c) F sharp
or
b) F sharp
c) G flat

48. The nearest key to the left of key number 6, a)___ natural, is key number 5, which may be called b)"___ ___" or c)"___ ___".

48. a) F
b) F flat
c) E natural
or
b) E natural
c) F flat

ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 13

After Frame 50, the class is drilled in finding the flats of various letters, by responding at their seats with the proper key number or at the piano by playing the proper key. At this point, each pupil is directed to place a "second sheet" (semi-transparent, measuring 8½ x 11 inches) over Panel I, so that the upper edges of each match, and so that the left-hand edge of the second sheet coincides with the black line edge of key number 1 on Panel I. Each pupil is then given the following directions: (1) trace the Panel I key numbers onto the second sheet in pencil, (2) print the letter names of the white keys (numbers 1 through 20) on the second sheet in pencil, just below Line A as it appears through the second sheet, (3) find the sharp key for each of the white key letters, and print the letter followed by a sharp sign on the second sheet in pencil, just below the key numbers which have been traced on the second sheet, (4) find the flat key for each of the white key letters, and print the letter followed by a flat sign on the second sheet in pencil, just above Line A as it appears through the second sheet. After each of the four directions above, adequate time is allowed for each step to be completed before the next direction is given.

For Frame 51, the teacher uses a sample Panel II as a visual aid to demonstrate this frame.

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 49. The nearest key to the left of key number 5, a)___natural, is key number 4, which may be called b)"___ ___" or c)"___ ___". | 49. a) E<br>b) E flat<br>c) D sharp<br>or<br>b) D sharp<br>c) E flat |
| 50. The nearest key to the left of key number 3, a)___ natural, is key number 2, which may be called b)"___ ___" or c)"___ ___". | 50. a) D<br>b) D flat<br>c) C sharp<br>or<br>b) C sharp<br>c) D flat |
| 51. Refer now to Panel II. Look at the double sharp sign. Notice that the double sharp will always be the second nearest key to the right of any white key, although the double sharp itself may be a black or a white key. | 51. Go on to the next frame. |
| 52. Refer now to Panel I. The second nearest key to the right of key number 1, C, is the white key, key number 3, which may be called "C double sharp". Of course, this is just another name for key number 3, which is also called a)"___" or b)"___ ___". | 52. a) D<br>b) D natural |

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 53. The second nearest key to the right of key number 3, a)___ natural, is the white key, key number b)___, which may be called "D double sharp", "E natural", or "F flat". | 53. a) D<br>b) 5 |
| 54. Frame 53 shows that it is possible to have____different names for one white key. | 54. three |
| 55. The second nearest key to the right of key number 5, E natural, is the a)___key, key number b)___, which may be called "E c)___ ___", "F sharp", or "G flat". | 55. a) black<br>b) 7<br>c) double sharp |
| 56. Frame 55 shows that it is possible to have ___ different names for one black key. | 56. three |

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 57. Find key number 6, a)___natural. The nearest key to the right, key number 7, may be called "F b)___", and the second nearest key to the right, key number 8, may be called "F c)______". | 57. a) F<br>b) sharp<br>c) double sharp |
| 58. Find key number 8, G. G sharp will be key number a)___ and G double sharp will be key number b)___. | 58. a) 9<br>b) 10 |
| 59. Find key number 10, A. A sharp will be key number a)___ and A double sharp will be key number b)___. | 59. a) 11<br>b) 12 |
| 60. Key number 12 has three names: a)___ double sharp, b)___ natural, and c)___ flat. | 60. a) A<br>b) B<br>c) C |

ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 16

After Frame 62, the class is drilled in finding the double sharp for each white key on Panel I (except for key number 24). If the double sharp is found on a white key, pupils are asked for its natural and/or sharp name; if found on a black key, for its sharp and flat name.

For Frame 63, the teacher uses a sample Panel II as a visual aid to demonstrate this frame.

Move the mask down to reveal the correct response and expose the next frame.

| | | |
|---|---|---|
| 61. | Find key number 12, B. B sharp will be key number a)___ and B double sharp will be key number b)___ | 61. a) 13<br>b) 14 |
| 62. | Key number 14 has three names: a)___ double sharp, b)___sharp, and c)___ flat. | 62. a) B<br>b) C<br>c) D |
| 63. | Refer now to Panel II. Look at the double flat sign. Notice that the double flat will always be the second nearest key to the left of any white key, although the double flat itself may be a black or a white key. | 63. Go on to the next frame. |
| 64. | Refer now to Panel I. The second nearest key to the left of key number 13, C, is the black key, key number 11, which may be called "C double flat". Of course, this is just another name for key number 11, which is also called a)"___flat" or b)"___ sharp". | 64. a) B<br>b) A |

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | |
|---|---|
| 65. The second nearest key to the left of key number 12, a)___natural, is the white key, key number b)___, which may be called "B double flat", "A natural", or "G double sharp". | 65. a) B<br>b) 10 |
| 66. The second nearest key to the left of key number 10, A natural, is the a)___ key, key number b)___, which may be called "A a)___ ___", "G natural", or "F double sharp". | 66. a) white<br>b) 8<br>c) double flat |
| 67. Find key number 8, a)___natural. The nearest key to the left, key number 7, may be called "G b)___", and the second nearest key to the left, key number 6, may be called "G c)___ ___". | 67. a) G<br>b) flat<br>c) double flat |
| 68. Find key number 6, F. F flat will be key number a)___ and F double flat will be key number b)___. | 68. a) 5<br>b) 4 |

ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 18

After Frame 72, the class is drilled in finding the double flat for each white key on Panel I (except for key number 1). If the double flat is found on a white key, pupils are asked for its natural and/or flat name; if found on a black key, for its sharp and flat name.

Move the mask
down to reveal the
correct response
and expose the
next frame.

69. Key number 4 has three letter names: a)___double flat, b)___flat, and c)___sharp.

69. a) F
b) E
c) D

70. Find key number 5, E. E flat will be key number a)___ and E double flat will be key number b)___.

70. a) 4
b) 3

71. Key number 3 has three names: a)___ double flat, b)___natural, and c)___ double sharp.

71. a) E
b) D
c) C

72. Key number 3 is D natural. D double flat can be found on the second nearest key to the left, key number___.

72. 1

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 19

After Frame 74, the class is drilled in finding three names for each of the key numbers from 2 through 23.

Before Frame 75 is attempted, the class is taught the relation of "up" to "raise" and "down" to "lower" with the teacher using Panel I as a visual aid, and with a short review of the relationship of "right" to "raise" and "left" to "lower". (Panel I is rotated so that the right end is up in the teacher's hands, and the left end is down.)

After Frame 76, the class is drilled in finding whole and half steps up and down from key numbers 3 through 22.

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 73. We have learned that five signs may be added to any letter name: natural, sharp, flat, double sharp, double flat. | 73. Go on to the next frame. |
| 74. We have also learned that any key, black or white, may have three names. | 74. Go on to the next frame. |
| 75. From any key to the nearest key is called a half step. A half step up from key number 3 is key number a)___; a half step down from key number 3 is key number b)___. | 75. a) 4<br>b) 2 |
| 76. From any key to the second nearest key is called a whole step. A whole step up from key number 3 is key number a)___: a whole step down from key number 3 is key number b)___. | 76. a) 5<br>b) 1 |

Page 20

Move the mask
down to reveal the
correct response
and expose the
next frame.

77. Any key made sharp will be a half step up from the natural key. Any key made double sharp will be a whole step up from that natural key.

77. Go on to the next frame.

78. A half step up from key number 3, a)___natural, will be key number b)___, called c)"___ ___"; a whole step up from key number 3 will be key number d)___, called e)"___ ___ ___".

78.
a) D
b) 4
c) D sharp
d) 5
e) D double sharp

79. Any key made flat will be a half step down from the natural key. Any key made double flat will be a whole step down from that natural key.

79. Go on to the next frame.

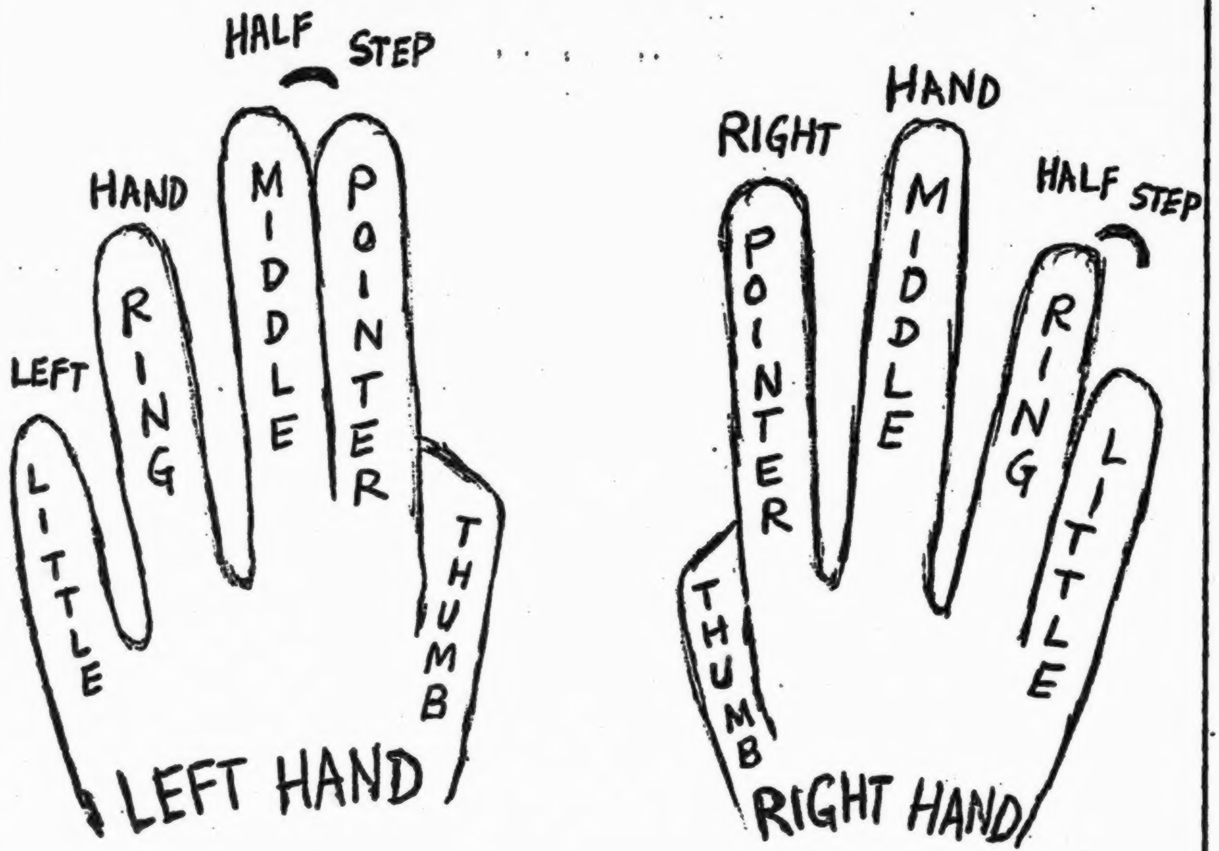
80. A half step down from key number 3, a)___natural, will be key number b)___, called c)"___ ___"; a whole step down from key number 3 will be key number d)___, called e)"___ ___ ___".

80.
a) D
b) 2
c) D flat
d) 1
e) D double flat

Move the mask down to reveal the correct response and expose the next frame

| | |
|---|---|
| 81. Refer now to Panel III. Panel III shows the finger pattern of whole and half steps needed to correctly play a major scale. Notice that both thumbs are tucked under the palm of the hand. | 81. Go on to the next frame. |
| 82. Notice that there is space between all the fingers of both hands, except the middle and pointer fingers of the left hand and the ring and little fingers of the right hand. | 82. Go on to the next frame. |
| 83. Hold your hands up in front of you with your palms away from you. Make your fingers match those of Panel III. Be sure that there is space between all the fingers of both hands, except the middle and pointer fingers of the left hand and the ring and little fingers of the right hand. These fingers have no space between. | 83. Go on to the next frame. |
| 84. You now have four fingers in each hand arranged as they will be needed to correctly play a major scale. ___ of the fingers in each hand have no space between. | 84. Two |

PANEL III


HALF STEP
LEFT
HAND
LITTLE
RING
MIDDLE
POINTER
THUMB
LEFT HAND
RIGHT
HAND
HALF STEP
POINTER
MIDDLE
RING
LITTLE
THUMB
RIGHT HAND

NOW I'VE PLAYED A MAJOR SCALE

Fig. H4.--Finger pattern for any major scale (Panel III).

ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 22

In Frame 85 it is important that the pupil place the fingers on the top portion of Panel III, so that the keys between the fingers will be apparent. However, the bottom portion is not to be folded under out of sight. The teacher must be alert to the possibility that some pupils might attempt to form the major scale using the bottom portion, and the teacher should take advantage of such occasions to point out how such procedure can cause errors.

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 85. Refer now to Panel I. Place the four fingers of the left hand on the top portion of Panel I so that the fingers are on the white keys, numbers 1, 3, 5, and 6. Place the four fingers of the right hand on the top portion of Panel I so that the fingers are on the white keys, numbers 8, 10, 12, and 13. | 85. Go on to the next frame. |
| 86. Notice that there is a key between all the fingers of both hands, except the middle and pointer fingers of the left hand and the ring and little fingers of the right hand. These fingers have no key between. | 86. Go on to the next frame. |
| 87. When there is no key between the fingers, those two fingers form a half step. You have formed a half step in your left hand between key numbers 5 and 6, and a half step in your right hand between key numbers a)___ and b)___. | 87. a) 12 or a) 13<br>b) 13 b) 12 |
| 88. When there is one key between the fingers, those two fingers form a whole step. | 88. Go on to the next frame. |

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 23

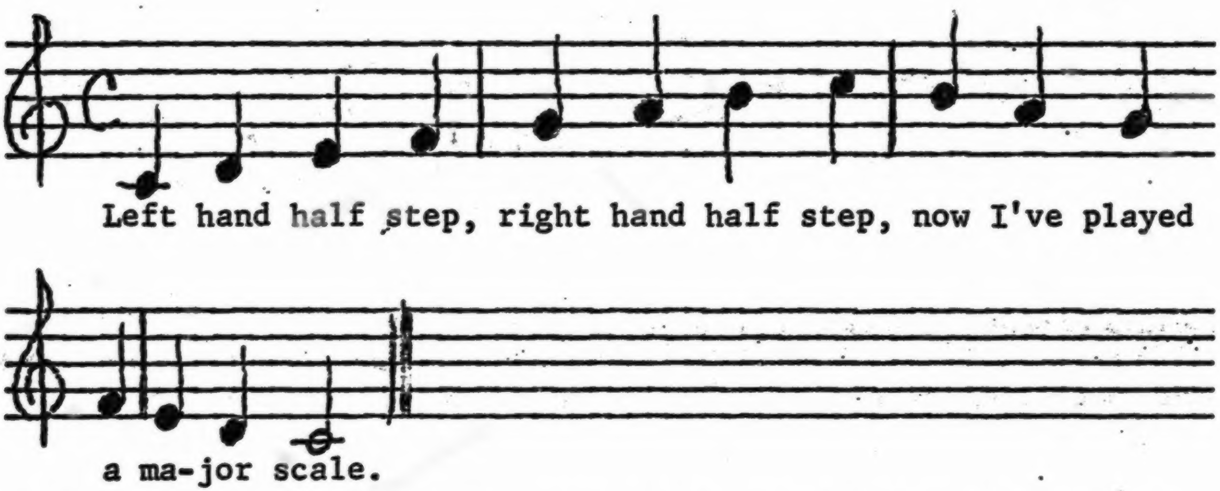
After Frame 90, the teacher should move up and down the aisles to make sure that each pupil has formed the C Major scale properly. The pupils are asked to leave their hands in position until the teacher has checked their scale formation.

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 89. Reading from left to right, you have formed whole steps in your left hand between key numbers 1 and 3 and key numbers 3 and 5; between your left and right hand you have formed a whole step between key numbers 6 and 8. | 89. Go on to the next frame. |
| 90. In your right hand you have formed a whole step between key numbers a)___ and b)___ and key numbers c)___ and d)___. | 90. a) 8<br>b) 10<br>c) 10<br>d) 12 |
| 91. You have just formed a C Major Scale. You have used the finger pattern of whole and half steps shown on Panel III. The fingers that have no space between are the fingers that have no key between; these are the fingers that play ___ steps. | 91. half |
| 92. The fingers that a space between are the fingers that have one key between; these are the fingers that play___ steps. | 92. whole |

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 24

After Frame 93, the following song should be taught to the class (the pupils should refer to Panel III for the words):



Before attempting Frame 94, each pupil should play the C Major scale at the piano, using the drill by rows procedure. The pupils sing the words of the above song as they play. Before they proceed to the piano, pupils are advised to use the bottom portion of the keyboard for better finger leverage, since they are using all white keys. They are also advised to practise at their seats moving each finger independently, to avoid repeating the top key of the scale, to use sufficient energy to produce a tone when they strike the key, and to avoid holding any finger down while others strike. Pupils are also advised that when they come to the piano, they should place all their fingers in position before starting the scale. (The teacher may aid those who have technical difficulty in moving their fingers by gently but rapidly pressing each of the pupil's finger tips to effect a tone; these pupils are advised to return to their seats with words of encouragement—that extra practise on their part at their seats will enable them eventually to produce the tone by themselves.)

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 93. The C Major Scale is the only major scale that is played on all white keys; all the other major scales use a combination of black and white keys. | 93. Go on to the next frame. |
| 94. In order to play the other major scales that use a combination of black and white keys, you will have to use the finger pattern of Panel III to know just which black and white keys to use. | 94. Go on to the next frame. |
| 95. Form a major scale starting with your left hand little finger on key number 2. Leave one key between each of the eight fingers you use except between the middle and pointer fingers of your left hand and the ring and little fingers of your right hand. | 95. Go on to the next frame. |
| 96. The correct key numbers are key numbers 2, 4, 6, 7, 9, 11, 13, and 14. Notice there is one key between each of the eight fingers you used except between the middle and pointer fingers of your a)___ hand and the ring and little fingers of your b)___ hand. | 96. a) left<br>b) right |

ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 25

After Frame 97, each pupil should form a major scale on key numbers 4, 5, 6, 7, 8, 9, 10, 11, and 12. The pupils do this at their seats using Panel I. The teacher appoints apt pupils as "helpers" to check the work of the class. As soon as a pupil is able to form any two of the above scales without assistance from the teacher or another pupil, the pupil plays any major scale designated by the teacher at the piano (as described on the preceding "Annotations" page). Before playing scales on white key starting tones, pupils are reminded to use the upper portion of the keyboard to avoid errors in finding the keys to be used, but to then slide the hands toward the body so as to put the fingers in the most expedient position for playing both black and white keys.

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 97. Now use the finger pattern of Panel III to form a major scale starting with your left hand little finger on key number 3. Be sure to use the upper portion of Panel I to avoid errors. | 97. Go on to the next frame |
| 98. The correct key numbers are key numbers 3, 5, 7, 8, 10, 12, 14, and 15. | 98. Go on to the next frame. |
| 99. Knowing the first five tones of all the major scales will help us to build triads (three-tone chords) on any key. You have been playing the first five tones of the major scale with the four fingers of the left and the ___ finger of the right hand. | 99. pointer |
| 100. Now refer to Panel IV. Study the finger pattern for any major triad (a___-tone chord). | 100. three |

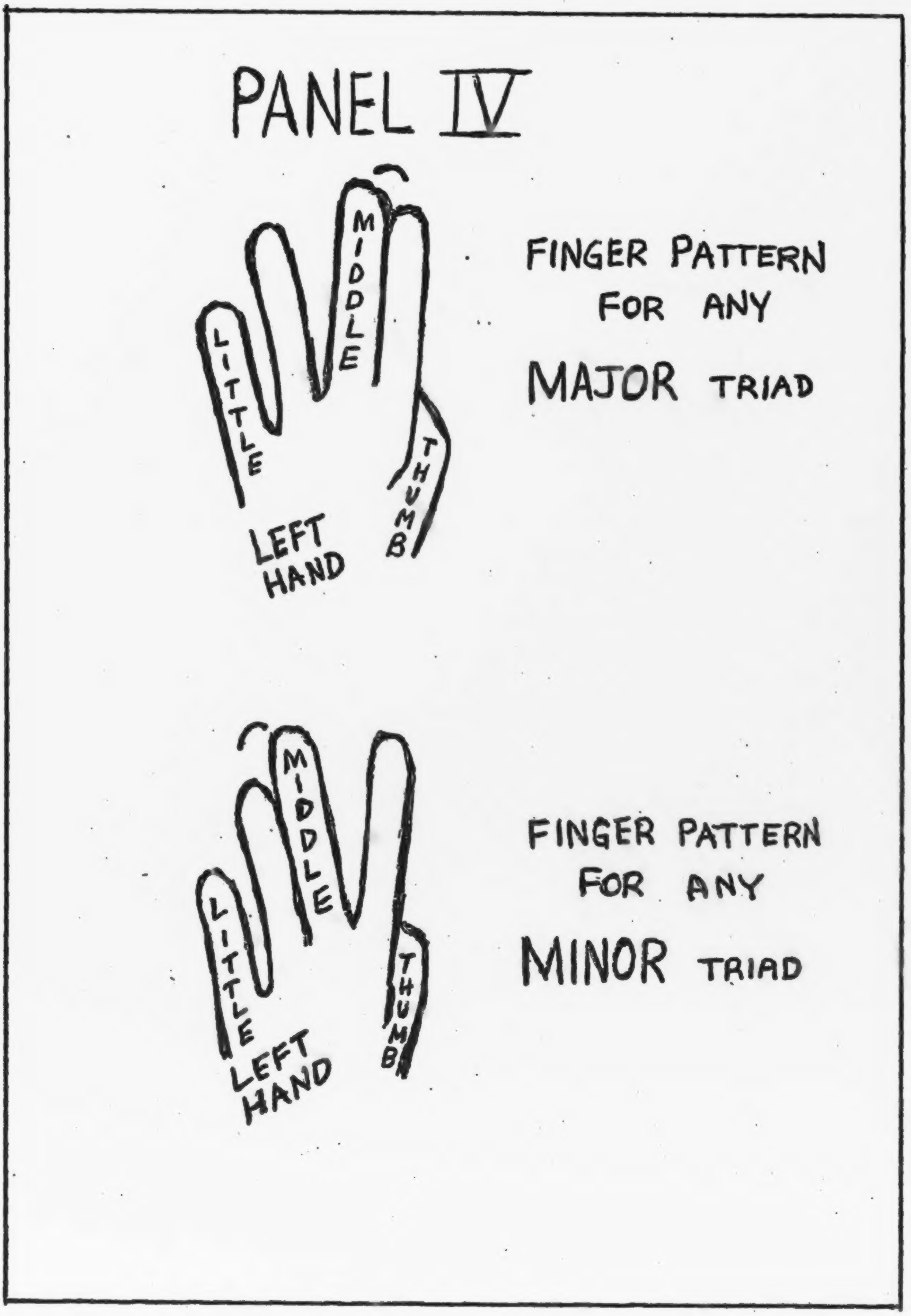

PANEL IV
MIDDLE
LITTLE
THUMB
LEFT HAND
FINGER PATTERN FOR ANY MAJOR TRIAD
MIDDLE
LITTLE
THUMB
LEFT HAND
FINGER PATTERN FOR ANY MINOR TRIAD

Fig. H5.--Finger patterns for any major or minor triad (Panel IV).

Move the mask down to reveal the correct response and expose the next frame.

| | | |
|---|---|---|
| 101. | Notice that only the left hand will be used to cover the first five keys of any major scale, and that the fifth key is not played by the pointer finger of the right hand, but by the ___ of the left hand instead. | 101. thumb |
| 102. | Notice also that only the little finger, the middle finger, and the thumb are named. That is because these three fingers are the ones that will play the tones of the three-tone chord called a ___. | 102. triad |
| 103. | Now form a major scale on key number 1, using Panel I. You will use the fingers on the left and right hands, but not the ___ on either hand. | 103. thumbs |
| 104. | Notice that the pointer finger of the right hand is on key number 8. Now remove the right hand, and place the left hand thumb on key number 8. The five fingers of your left hand are now on key numbers 1, 3, 5, 6, and 8. | 104. Go on to the next frame. |

Move the mask
down to reveal the
correct response
and expose the
next frame.

| | |
|---|---|
| 105. Even though the five fingers of your left hand must cover the correct five-key pattern for the first five keys of the major scale, you will play only the little finger, the middle finger, and the thumb to form a a)___-tone chord called a b)___. | 105. a) three<br>b) triad |
| 106. Even though your fingers are covering key numbers 1, 3, 5, 6, and 8, you will only play key numbers a)___, b)___, and c)___ to form a major triad. | 106. a) 1<br>b) 5<br>c) 8 |
| 107. With the pointer finger of the right hand gently but rapidly press the tips of the fingers that are covering key numbers 1, 5, and 8. These three key numbers form a major triad built on key number 1. | 107. Go on to the next frame. |
| 108. Now refer to Panel IV. Study the finger pattern for any minor triad. Notice that the only difference in the finger pattern for the minor triad, as compared to the major triad, is that the middle finger is close to the ring finger instead of the left hand ___ finger. | 108. pointer |

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 109. The half step in the major triad finger position is between the middle and pointer fingers; the half step in the minor triad finger position is between the middle and ___ fingers. | 109. ring |
| 110. Place the five fingers of your left hand on key numbers 1, 3, 5, 6, and 8 of Panel I. Key numbers 1, 5, and 8 form a ___ triad because the half step of the finger pattern is between the middle and pointer fingers. | 110. major |
| 111. Keep your left hand in position over the keys used in Frame 110, but, using the thumb and pointer finger of your right hand, grasp the tip of your left hand middle finger and move it a half step down to key number 4. | 111. Go on to the next frame. |
| 112. With the pointer finger of the right hand gently but rapidly press the tips of the fingers that are covering key numbers 1, 4, and 8. These three key numbers form a minor triad built on key number 1. | 112. Go on to the next frame. |

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 29

After Frame 113, each pupil plays a major and minor triad at the piano with Middle C* as a root. Before coming to the piano, the class is advised that each pupil, immediately upon being seated at the piano, should depress the damper (right) pedal with the right foot in order to sustain the tones of the triad as they are individually sounded. The pedal should remain depressed to allow the pupil to hear the resultant harmony. The teacher, standing by the piano, lets the pupil know when to lift the pedal, when to change finger position to form the minor triad, when to sound the tones of the minor triad, when to again depress the pedal, and when to again lift the pedal. Pupils are advised to use the pointer finger of the right hand to gently but rapidly press the tips of the little finger, the middle finger, and the thumb to activate the key at the piano, but they should practise at their seats moving the three fingers independently (to produce a "broken" triad) and in conjunction (to produce a "solid" triad) without the aid of the right hand.

---

*Middle C is the C nearest the middle of the keyboard.

Move the mask down to reveal the correct response and expose the next frame.

| | |
|---|---|
| 113. In the finger pattern for a minor triad the ___ ___ is between the middle and ring fingers. | 113. half step |
| 114. Form a major triad, building on key number 2. First place the fingers of the left hand over key numbers a)___, b)___, c)___, d)___, and e)___. | 114. a) 2<br>b) 4<br>c) 6<br>d) 7<br>e) 9 |
| 115. With the pointer finger of the right hand gently but rapidly press the tips of the fingers that are covering key numbers a)___, b)___, and c)___. | 115. a) 2<br>b) 6<br>c) 9 |
| 116. You have formed a major triad built on key number 2. To change it to a minor triad, simply move the ___ finger a half step down (using the thumb and pointer finger of your right hand to grasp the tip of that finger). | 116. middle |

## ANNOTATIONS FOR PROGRAMMED LEARNING, "EXPLORING THE KEYBOARD", PAGE 30

After Frame 118, each pupil should form first a major and then a minor triad on key numbers 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12. The pupils practise this at their seats using Panel I. The teacher appoints apt pupils as "helpers" to check the work of the class. As soon as the pupil is able to form (without assistance from the teacher or another pupil) the major and minor triads in root position using any two of the above key numbers as roots, the pupil plays a major and a minor triad at the piano, using as a root any key designated by the teacher. Pupils may play the triads as "solid" chords (all three tones played simultaneously) or as "broken" chords (the three tones played in quick succession from lowest to highest tone, holding each tone until after all three have been played with or without the aid of the pedal) without the aid of the right hand. Those pupils who still experience technical difficulty may employ the right hand pointer finger and the damper pedal to assist in producing the triad sound (as described on the preceding "Annotations" page).

Move the mask down to reveal the correct response and expose the next frame.

| | | | |
|---|---|---|---|
| 117. | Your five fingers are now over key numbers a)___, b)___, c)___, d)___, and e)___, but only f)___ of these key numbers will be pressed to form the minor triad. | 117. | a) 2<br>b) 4<br>c) 5<br>d) 7<br>e) 9<br>f) three |
| 118. | To form the minor triad, use the pointer finger of the right hand to gently but rapidly press the tips of the fingers that are covering key numbers a)___, b)___, and c)___. | 118. | a) 2<br>b) 5<br>c) 9 |
| 119. | The finger patterns shown on Panel IV are used to form major and minor triads in root position. There are other positions for triads, but the patterns you have learned are for triads in root position. The other positions are easy to form if you once know how to form root position. | 119. | Go on to the next frame. |
| 120. | Root positions of triads are formed by locating the first five tones of a a)___scale. The first, third, and fifth tones of the scale form a major triad; if the third tone is lowered a half step, a b)___ triad is formed. | 120. | a) major<br>b) minor |

## APPENDIX I. STAFF KNOWLEDGE TEACHING PROCEDURE DETAILS

When the pupils have completed the programmed learning material (see Appendix H) of Area 2 (Knowledge of Fundamental Concepts of Tonal Organization), the grand staff is then introduced as a graph of the keyboard (see Fig. I1, page I-2).

This is done in the following manner (references are to Fig. I1, page I-2, and its lettered sections):

1. A paper keyboard (as in section"d") is mounted on the blackboard with masking tape.

2. A horizontal line is drawn to D (middle line of bass clef), and pupils are asked to name the white key to which the line points. Horizontal lines are then drawn pointing to each of the alternate white keys above and below that key, and each line is lettered accordingly.

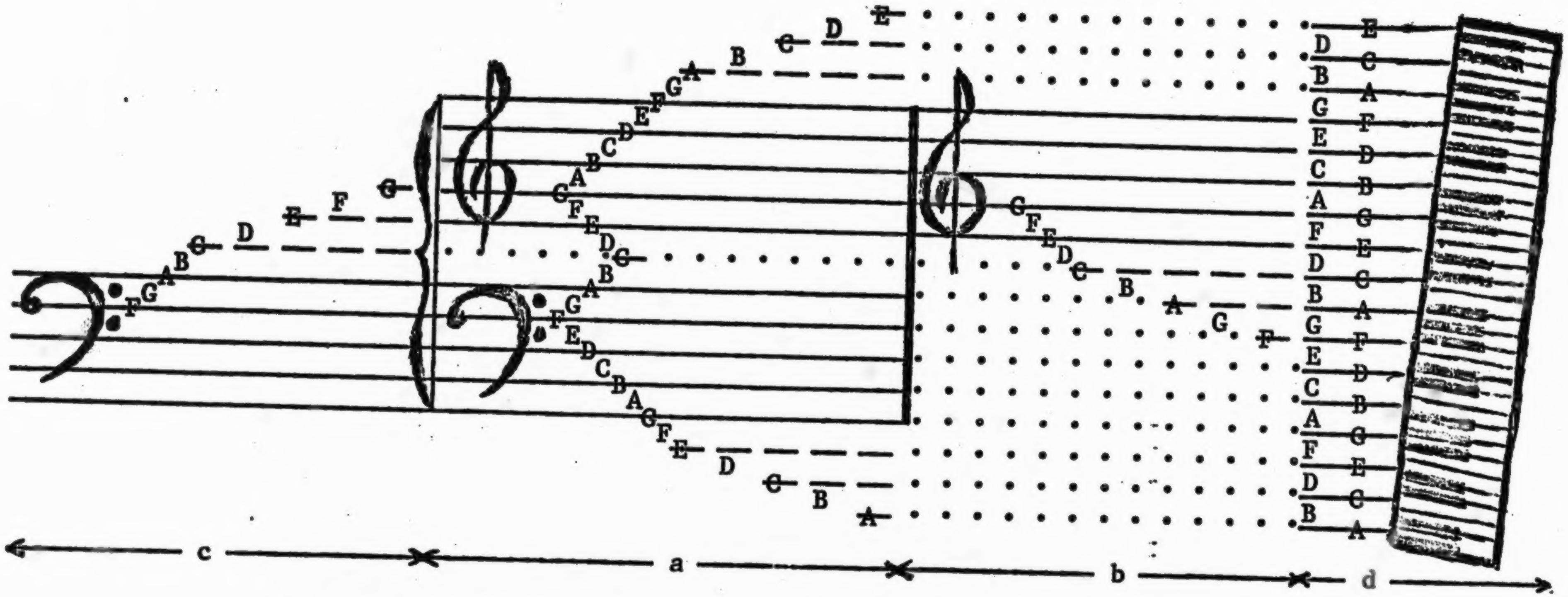
3. The class is then asked to discover a pattern of white keys used in drawing the lines. (If the class fails to make the discovery, the teacher reveals that every other white key has a line pointing to it.)

4. The teacher shows that since D (middle line of bass clef) and the F above it are both represented by lines, the key between, E, is represented by the space between D's line and F's line. Pupils are then asked to supply the remaining space letters. (Alphabet used forward ascending, backward descending.)

5. The teacher explains the difference between a line letter and a space letter (the line letter has a line through the middle of the letter; the space letter does not). The teacher then draws circles (note heads) around each of the letters, explaining the difference between a line note and a space note (the line note has a line through the middle of the note head; the space note does not).

6. The teacher points out that note heads are drawn without letters inside of them when music is written or printed, but that for practise purposes in correctly naming the various lines and spaces, the pupils will place letter names inside the note heads.

7. The teacher points out that just as all the white keys look alike, all the lines and spaces look alike, making it difficult to name each line and space if there is no keyboard to which the lines may point. To demonstrate this, the teacher erases the notes and letters as well as that portion of the


c
a
b
d
D B G E C A F D B G E C A F D B
E C A F D B G E C A F D B G E C A

Section "a": The grand staff with leger line extensions
Section "b": The treble staff with leger line extensions below the staff
Section "c": The bass staff with leger line extensions above the staff
Section "d": The staff lines pointing to alternate white keys of a keyboard

Fig. I1.--The grand staff—a graph of the keyboard lines on which they had been drawn, leaving only seventeen horizontal parallel lines. The paper keyboard is removed, and the pupils asked to name various lines.

8. The teacher then extends certain lines to the left: all the lines except the top and bottom three lines and the middle line. The teacher draws a G clef and an F clef on the staffs thus formed, explaining (a) the relationship of the clefs to the letters G and F, (b) that the G clef locates the line G at the point where the upright line of the G clef crosses the line of the staff inside the loop of the G clef, (c) that the F clef locates the line F between the two dots following the clef.

9. An enlarged drawing of Fig. I1 is then mounted on the blackboard. However, section "c" is folded out of view behind section"a", and section "b" is folded so that the bar line at the right edge of section "a" touches the solid lines at the left edge of section "d".

10. The teacher explains that the two sets of five lines make reading easier than the one large group of seventeen lines; the teacher also points out the use of leger lines as extensions of the original top and bottom three lines of the seventeen lines of section "d" (to be used when notes this high or low are required), and as an extension of the middle line of the seventeen lines of section "d" (to be used when this middle line note is required).

11. The teacher introduces and defines the terms "staff", "treble staff", "bass staff", "grade staff", "brace", "bracket".

12. The teacher demonstrates how all the lines and spaces of the staff are named by using the alphabet backwards and forwards from the treble staff G line and the bass staff F line. It is also pointed out that leger lines are only added as needed; that space notes above the staff require lines beneath the notes but not above them; that space notes below the staff require lines above the notes but not below them; that additional leger lines beyond those shown may be added to picture the entire keyboard, but that special signs are used to avoid too many leger lines (such as "8", "8va" "8va bassa", etc.). The pupils are advised that they need not be concerned with further extension of the grand staff at the present time.

13. The enlarged drawing of Fig. I1 is removed from the blackboard. Two staffs, the connecting brace and bar lines, G clef and F clef are drawn in chalk on the blackboard. The teacher makes the notes, "G clef's G" and "F clef's F". Pupils then come by rows to the blackboard to add one note each either up or

down from the notes drawn by the teacher. Each pupil must make a line note if the preceding pupil has made a space note; each pupil must make a space note if the preceding pupil has made a line note; no lines or spaces may be skipped. This procedure is continued until the grand staff notes (without letters) are completed as in section "a" of Fig. I1. If a pupil errs, the next pupil makes the correction; if that pupil errs, one of the seated pupils is asked to volunteer to make the correction. Pupils then come by rows to the blackboard and place the correct letter inside each of the note heads, beginning with "G clef's G" or "F clef's F", and adding one letter each to a note adjacent to a note lettered by a pupil before him.

14. A special drill is made of making leger lines, notes, and letters, above the staff, following the procedures of the preceding paragraph.

15. The procedures of paragraphs "13." and "14." are repeated until the pupils evidence familiarity with the procedure. Then, by rows, the pupils come to the board for a speed drill. The teacher draws the staffs and clefs, and the pupils race to see who can first correctly complete the notes and letters of the grand staff.

When the fifteen steps above have been completed, the pupils are each given a copy of Form A (see Fig. I2, page I-5), and are asked to complete it by a (a) drawing in all the note heads first, starting with either "G clef's G" or "F clef's F", (b) printing inside each note head the correct letter, beginning with either "G clef's G" or "F clef's F". The teacher insists that all note head drawing be approved before the pupil may proceed with lettering; to assist in this checking of the pupils' work the teacher appoints apt pupils as "helpers". (Form A is shown correctly completed in Fig. I3, page I-6).

When Form A has been correctly completed by the class, the teacher then places a grand staff on the board with considerable space left between the two staffs. The teacher explains that frequently leger lines are used above the bass staff or below the treble staff. To illustrate this, the teacher displays the enlarged copy of Fig. I1, explaining that the leger lines in section "c" are merely extensions of the grand staff (section "a") and that the leger lines in section "b" are merely extensions of the grand staff (section "a"). The teacher returns to the grand staff made with chalk, inserting several leger line notes between the staffs. Some of these notes are notated under the treble staff; others are notated above the bass staff. The pupils are taught to distinguish between these two types: if a leger line appears above a note between the staffs, the note is

NAME________________________ ROOM______ FORM A

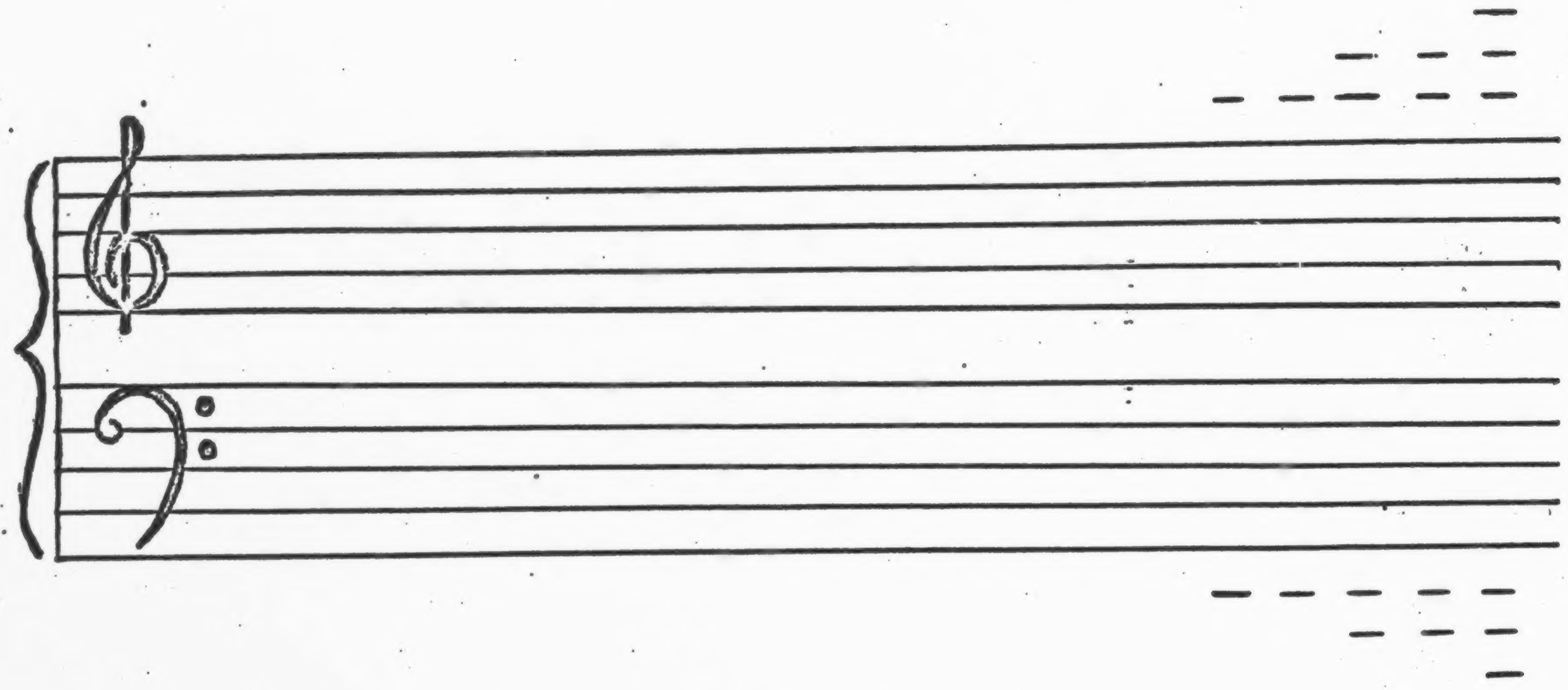


Fig. I2.--Form A, written classwork in Area 1 (Staff Knowledge).

NAME______________________ ROOM _____

FORM A

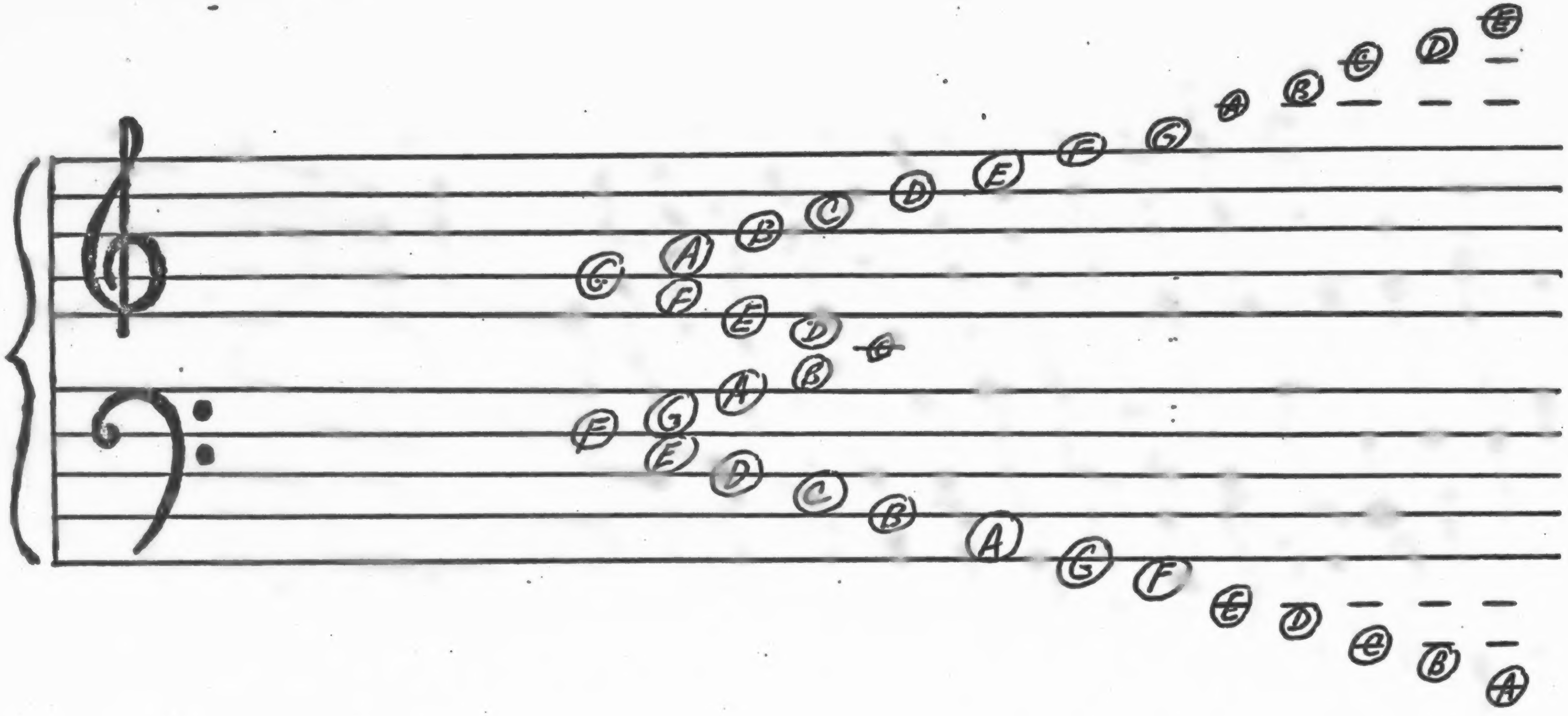

G A B C D E F G A B C D E
F E D C
F G A B
E D C B A G F E D C B A

Fig. 13.--Form A, written classwork in Area 1 (Staff Knowledge) completed correctly.

read by lettering down (backwards) from "G clef's G"; if a leger line appears below a note between the staffs, the note is read by lettering up (forwards) from "F clef's F". The first leger line above the bass staff or below the treble staff is C. This latter fact can be illustrated by referring to Fig. I1, comparing the c's of sections "c" and "b" with the dotted line c of section "a". (The author avoids the term "Middle C" at this point; it is not always in the middle of the two staffs, and it is not the middle of the piano keyboard.)

Next, the pupils are each given a copy of Form B (see Fig. I4, page I-8), and are asked to first complete only the upper treble and bass staffs by (a) drawing all the note heads down from "G clef's G" and printing the correct letter name in each and (b) drawing all the note heads up from "F clef's F" and printing the correct letter name in each. This work is approved by the teacher (or apt pupils chosen to assist) before the pupils are permitted to complete the lower treble and bass staffs of Form B. The pupil is advised that he may help in checking his own work on the upper staffs by referring to the dotted lines connecting staff lines and leger lines; the letters connected by the dotted lines should agree.

The instructions for completing the lower staffs of Form B are the same as (a) and (b) of the preceding paragraph. This work is also checked by the teacher (or by "helpers").

Form B is shown correctly completed in Fig. I5, page I-9.

NAME ______________________ ROOM ________ **FORM B**

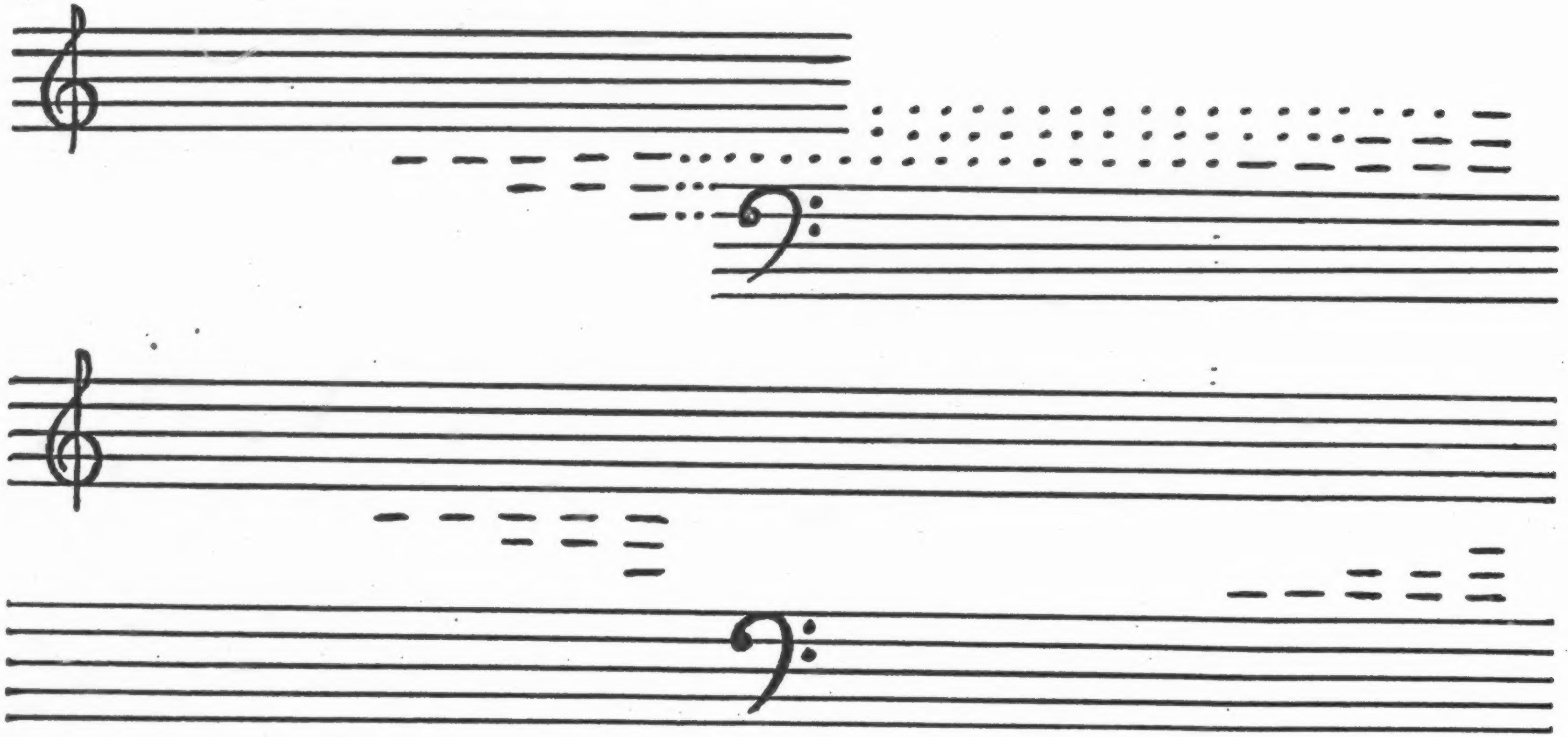


Fig. I4.-- Form B, written classwork in Area 1 (Staff Knowledge).

**NAME** ______________________ **ROOM** ________ **FORM B**

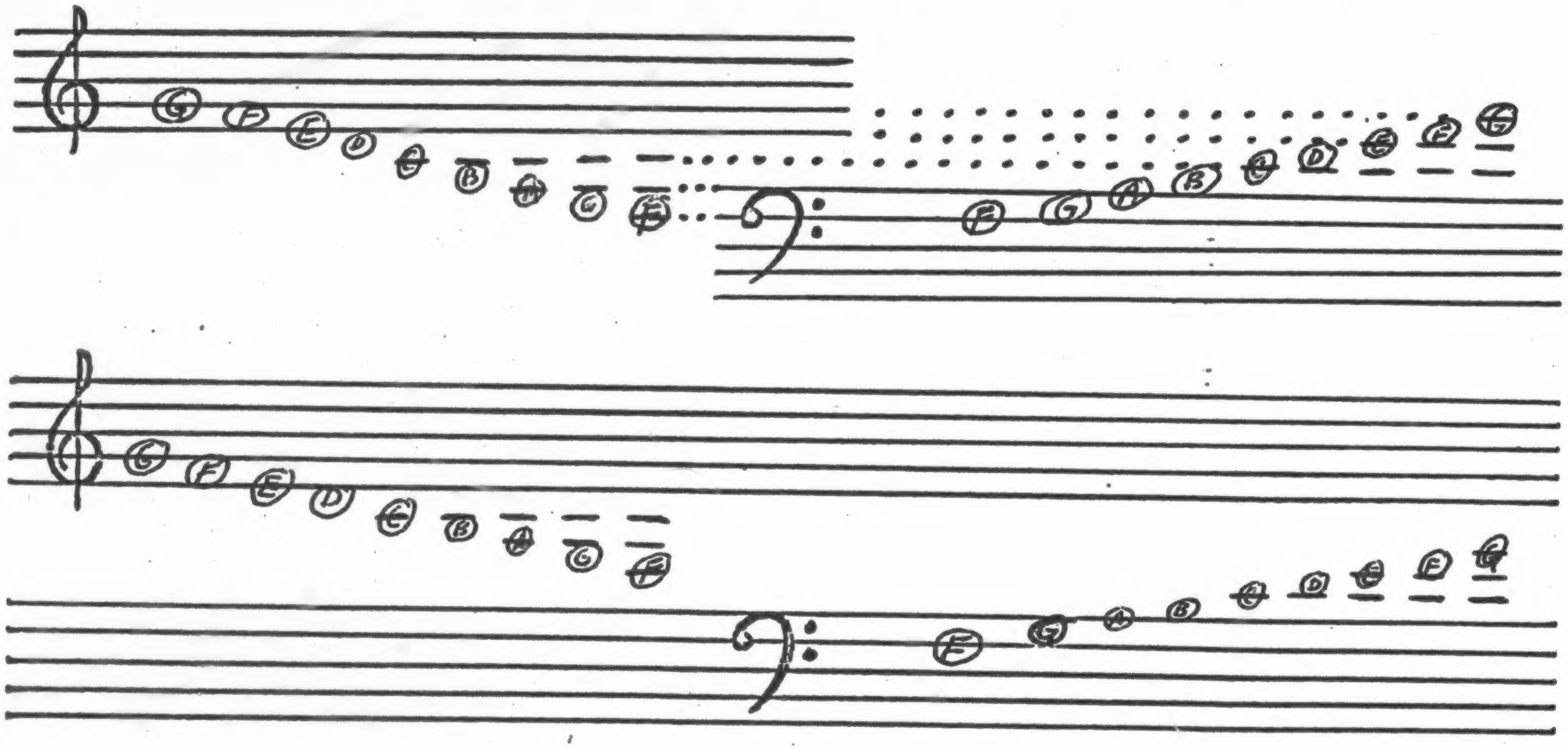

G F E D C B A G F
F G A B C D E F G
G F E D C B A G F
F G A B C D E F G

Fig. I5.--Form B, written classwork in Area 1 (Staff Knowledge) completed correctly.

# APPENDIX J. TABLES OF RESULTS OF MANN-WHITNEY U TESTS

## TABLE XIII

## TESTS OF STAFF KNOWLEDGE: EXPERIMENTAL VERSUS CONTROL GROUPS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] N1 | Median Scores[c] N2 | Decision |
|---|---|---|---|---|---|---|---|
| Pre Tests | | | | | | | |
| Grade 4 | 62 | 81 | 2319 | .790 | .. | .. | Accept $H_0$ |
| Grade 5 | 75 | 59 | 2118 | .427 | .. | .. | Accept $H_0$ |
| Grade 6 | 86 | 68 | 2131 | 2.898[d] | 7 | 8 | Reject $H_0$; Accept $H_1$ (N2 higher) |
| Grades 4,5,6 | 223 | 208 | 21675 | 1.104 | .. | .. | Accept $H_0$ |
| Change Scores (Pre Test to Post Test) | | | | | | | |
| Grade 4 | 62 | 81 | 1710 | 3.271[d] | 3 | 0 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 5 | 75 | 59 | 1333 | 3.950[e] | 5 | 1 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 6 | 86 | 68 | 1295 | 5.936[f] | 6 | 0 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 223 | 208 | 13013 | 7.890[g] | 5 | 0 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Post Tests | | | | | | | |
| Grade 4 | 62 | 81 | 1650 | 3.520[h] | 8 | 6 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 5 | 75 | 59 | 1473 | 3.323[h] | 11 | 7 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 6 | 86 | 68 | 1785 | 4.151[e] | 13 | 7 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 223 | 208 | 14498 | 6.743[g] | 11 | 7 | Reject $H_0$; Accept $H_1$ (N1 higher) |

TABLE XIII—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] | | Decision |
|---|---|---|---|---|---|---|---|
| | | | | | N1 | N2 | |
| Change Scores (Post Test to Terminal Test) | | | | | | | |
| Grade 4 | 35 | 69 | 543 | 4.595[i] | 4 | 0 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 5 | 66 | 52 | 1131 | 3.075[d] | 3 | 1 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 6 | 50 | 38 | 787 | 1.376 | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 151 | 159 | 8016 | 4.994[j] | 3 | 0 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Terminal Tests | | | | | | | |
| Grade 4 | 35 | 69 | 343 | 5.919[f] | 16 | 5 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 5 | 66 | 52 | 833 | 4.791[i] | 20 | 8 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grade 6 | 50 | 38 | 474 | 4.016[e] | 17 | 7 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 151 | 159 | 4934 | 8.976[g] | 18 | 7 | Reject $H_0$; Accept $H_1$ (N1 higher) |

[a] N1 = Experimental Group.

[b] N2 = Control Group.

[c] Median Scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 40.

[d] Level of Significance: less than .01, greater than .001.

[e] Level of Significance: less than .0001, greater than .00001.

[f] Level of Significance: less than .00000001, greater than .000000001.

[g] Level of Significance: less than .000000001.

[h] Level of Significance: less than .001, greater than .0001.

[i] Level of Significance: less than .00001, greater than .000001.

[j] Level of Significance: less than .000001, greater than .0000001.

## TABLE XIV

## TESTS OF STAFF KNOWLEDGE: MALE VERSUS FEMALE PUPILS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Pre Tests |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 109 | 114 | 5143 | 2.239[d] | 5 | 7 | Reject $H_0$; Accept $H_1$ (N2 higher) |
| Control Grades 4,5,6..... | 99 | 109 | 5033 | .841 | .. | .. | Accept $H_0$ |
| Change Scores (Pre Test to Post Test) |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 109 | 114 | 5039 | 2.440[e] | 7 | 4 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Control Grades 4,5,6..... | 99 | 109 | 4917 | 1.108 | .. | .. | Accept $H_0$ |
| Post Tests |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 109 | 114 | 5260 | 1.981[d] | 14 | 9 | Reject $H_0$; Accept $H_1$ (N1 higher) |
| Control Grades 4,5,6..... | 99 | 109 | 5238 | .365 | .. | .. | Accept $H_0$ |

TABLE XIV—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Change Scores (Post Test to Terminal Test) |  |  |  |  |  |  |  |
| Experimental<br>Grades<br>4,5,6..... | 68 | 83 | 2360 | 1.618 | .. | .. | Accept $H_0$ |
| Control<br>Grades<br>4,5,6..... | 76 | 83 | 2810 | 1.194 | .. | .. | Accept $H_0$ |
| Terminal Tests |  |  |  |  |  |  |  |
| Experimental<br>Grades<br>4,5,6..... | 68 | 83 | 2739 | .311 | .. | .. | Accept $H_0$ |
| Control<br>Grades<br>4,5,6..... | 76 | 83 | 2654 | 1.732 | .. | .. | Accept $H_0$ |

[a] N1 = Male pupils.

[b] N2 = Female pupils.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 40.

[d] Level of significance: less than .05, greater than .02.

[e] Level of significance: less than .02, greater than .01.

## TABLE XV

### TESTS OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION: EXPERIMENTAL VERSUS CONTROL GROUPS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] | | Decision |
|---|---|---|---|---|---|---|---|
| | | | | | N1 | N2 | |
| | | | | Pre Tests | | | |
| Grade 4 | 90 | 78 | 3169 | 1.112 | .. | .. | Accept $H_0$ |
| Grade 5 | 79 | 60 | 1918 | 1.952 | .. | .. | Accept $H_0$ |
| Grade 6 | 87 | 72 | 2360 | 2.703[d] | 4 | 2 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 256 | 210 | 22009 | 3.418[e] | 3 | 2 | Reject $H_0$; accept $H_1$ (N1 higher) |
| | | | Change Scores (Pre Test to Post Test) | | | | |
| Grade 4 | 90 | 78 | 845 | 8.517[f] | 4 | 0 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 5 | 79 | 60 | 796 | 6.721[f] | 5 | 0 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 6 | 87 | 72 | 1187 | 6.759[f] | 5 | 0 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 256 | 210 | 8556 | 12.722[f] | 5 | 0 | Reject $H_0$; accept $H_1$ (N1 higher) |
| | | | | Post Tests | | | |
| Grade 4 | 90 | 78 | 702 | 8.994[f] | 6 | 1 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 5 | 79 | 60 | 715 | 7.063[f] | 7 | 3 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 6 | 87 | 72 | 1057 | 7.216[f] | 7 | 3 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 256 | 210 | 7554 | 13.420[f] | 6 | 2 | Reject $H_0$; accept $H_1$ (N1 higher) |

TABLE XV—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Change Scores (Post Test to Terminal Test) |  |  |  |  |  |  |  |
| Grade 4 | 49 | 66 | 1466 | .738 | .. | .. | Accept $H_0$ |
| Grade 5 | 65 | 54 | 1018 | 3.952[g] | 4 | 1 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 6 | 51 | 39 | 434 | 4.594[h] | 4 | 0 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 165 | 159 | 8190 | 5.815[i] | 3 | 0 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Terminal Tests |  |  |  |  |  |  |  |
| Grade 4 | 49 | 66 | 635 | 5.599[j] | 7 | 2 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 5 | 65 | 54 | 194 | 8.355[f] | 12 | 3 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 6 | 51 | 39 | 221 | 6.327[f] | 12 | 4 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 165 | 159 | 3075 | 11.916[f] | 12 | 3 | Reject $H_0$; accept $H_1$ (N1 higher) |

[a] N1 = Experimental group.

[b] N2 = Control group.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 20.

[d] Level of significance: less than .01, greater than .001.

[e] Level of significance: less then .001, greater than .0001.

[f] Level of significance: less than .000000001.

[g] Level of significance: less than .0001, greater than .00001.

[h] Level of significance: less than .00001, greater than .000001.

[i] Level of significance: less than .00000001, greater than .000000001.

[j] Level of significance: less than .0000001, greater than .00000001.

5

## TABLE XVI

### TESTS OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION: MALE VERSUS FEMALE PUPILS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] | | Decision |
|---|---|---|---|---|---|---|---|
| | | | | | N1 | N2 | |
| | | | | Pre Tests | | | |
| Experimental Grades 4,5,6..... | 128 | 128 | 7572 | 1.061 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 105 | 105 | 5270 | .562 | .. | .. | Accept $H_0$ |
| | | | | Change Scores (Pre Test to Post Test) | | | |
| Experimental Grades 4,5,6..... | 128 | 128 | 7733 | .777 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 105 | 105 | 4782 | 1.685 | .. | .. | Accept $H_0$ |
| | | | | Post Tests | | | |
| Experimental Grades 4,5,6..... | 128 | 128 | 7791 | .679 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 105 | 105 | 5050 | 1.067 | .. | .. | Accept $H_0$ |

TABLE XVI—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Change Scores (Post Test to Terminal Test) |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 79 | 86 | 2589 | 2.643[d] | 2 | 4 | Reject $H_0$; accept $H_1$ (N2 higher) |
| Control Grades 4,5,6..... | 80 | 79 | 2994 | .447 | .. | .. | Accept $H_0$ |
| Terminal Tests |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 79 | 86 | 2957 | 1.438 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 80 | 79 | 3137 | .080 | .. | .. | Accept HO |

[a] N1 = Male pupils.

[b] N2 = Female pupils.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 20.

[d] Level of significance: less than .01, greater than .001.

## TABLE XVII

### TESTS OF RHYTHMIC DISCRIMINATION: EXPERIMENTAL VERSUS CONTROL GROUPS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Mean Scores[d] |  | Decision |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 | N1 | N2 |  |
| Pre Tests |  |  |  |  |  |  |  |  |  |
| Grade 4 | 85 | 76 | 2856 | 1.289 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 80 | 59 | 2273 | .377 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 86 | 71 | 2764 | 1.031 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 251 | 206 | 25419 | .313 | .. | .. | .. | .. | Accept $H_0$ |
| Change Scores (Pre Test to Post Test) |  |  |  |  |  |  |  |  |  |
| Grade 4 | 85 | 76 | 2542 | 2.357[e] | 0 | 0 | +.27 | -.62 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grade 5 | 80 | 59 | 2311 | .211 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 86 | 71 | 2531 | 1.858 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 251 | 206 | 25333 | .374 | .. | .. | .. | .. | Accept $H_0$ |
| Post Tests |  |  |  |  |  |  |  |  |  |
| Grade 4 | 85 | 76 | 2676 | 1.912 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 80 | 59 | 2305 | .238 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 86 | 71 | 2782 | .969 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 251 | 206 | 25086 | .554 | .. | .. | .. | .. | Accept $H_0$ |
| Change Scores (Post Test to Terminal Test) |  |  |  |  |  |  |  |  |  |
| Grade 4 | 47 | 72 | 1602 | .497 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 66 | 53 | 1486 | 1.427 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 57 | 39 | 848 | 1.988[f] | 0 | 1 | .. | .. | Reject $H_0$; accept $H_1$ (N2 higher) |
| Grades 4,5,6 | 170 | 164 | 13700 | .275 | .. | .. | .. | .. | Accept $H_0$ |

## TABLE XVII-Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Mean Scores[d] |  | Decision |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 | N1 | N2 |  |
| Terminal Tests |  |  |  |  |  |  |  |  |  |
| Grade 4 | 47 | 72 | 1378 | 1.742 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 66 | 53 | 1529 | 1.191 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 57 | 39 | 791 | 2.421[e] | 4 | 5 | .. | .. | Reject $H_0$; accept $H_1$ (N2 higher) |
| Grades 4,5,6 | 170 | 164 | 12953 | 1.133 | .. | .. | .. | .. | Accept $H_0$ |

[a] N1 = Experimental group.

[b] N2 = Control group.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 10.

[d] Mean scores shown only if median scores are tied. Perfect score = 10.

[e] Level of significance: less than .02, greater than .01.

[f] Level of significance: less than .05, greater than .02.

## TABLE XVIII

## TESTS OF RHYTHMIC DISCRIMINATION: MALE VERSUS FEMALE PUPILS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Pre Tests |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 121 | 130 | 7105 | 1.334 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 102 | 104 | 5171 | .315 | .. | .. | Accept $H_0$ |
| Change Scores (Pre Test to Post Test) |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 121 | 130 | 7561 | .535 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 102 | 104 | 5226 | .184 | .. | .. | Accept $H_0$ |
| Post Tests |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 121 | 130 | 6645 | 2.153[d] | 4 | 3 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Control Grades 4,5,6..... | 102 | 104 | 5006 | .708 | .. | .. | Accept $H_0$ |

## TABLE XVIII—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Change Scores (Post Test to Terminal Test) |  |  |  |  |  |  |  |
| Experimental<br>Grades<br>4,5,6..... | 79 | 91 | 1813 | .324 | .. | .. | Accept $H_0$ |
| Control<br>Grades<br>4,5,6..... | 80 | 84 | 2621 | 2.452[e] | 0 | 1 | Reject $H_0$; accept $H_1$ (N2 higher) |
| Terminal Tests |  |  |  |  |  |  |  |
| Experimental<br>Grades<br>4,5,6..... | 79 | 91 | 3271 | 1.023 | .. | .. | Accept $H_0$ |
| Control<br>Grades<br>4,5,6..... | 80 | 84 | 2839 | 1.738 | .. | .. | Accept $H_0$ |

[a] N1 = Male pupils.

[b] N2 = Female pupils.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 10.

[d] Level of significance: less than .05, greater than .02.

[e] Level of significance: less than .02, greater than .01.

## TABLE XIX

### TESTS OF INTERVAL RECOGNITION: EXPERIMENTAL VERSUS CONTROL GROUPS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Mean Scores[d] |  | Decision |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 | N1 | N2 |  |
| Pre Tests |  |  |  |  |  |  |  |  |  |
| Grade 4 | 84 | 80 | 3013 | 1.169 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 76 | 60 | 1986 | 1.311 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 79 | 68 | 2406 | 1.108 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 239 | 208 | 21998 | 2.139[e] | 2 | 2 | 2.58 | 2.12 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Change Scores (Pre Test to Post Test) |  |  |  |  |  |  |  |  |  |
| Grade 4 | 84 | 80 | 2985 | 1.248 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 76 | 60 | 2280 | .000 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 79 | 68 | 2373 | 1.231 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 239 | 208 | 24798 | .043 | .. | .. | .. | .. | Accept $H_0$ |
| Post Tests |  |  |  |  |  |  |  |  |  |
| Grade 4 | 84 | 80 | 3223 | .459 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 76 | 60 | 1938 | 1.522 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 79 | 68 | 2130 | 2.189[e] | 3 | 2 | .. | .. | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 239 | 208 | 22201 | 1.978[e] | 3 | 2 | .. | .. | Reject $H_0$; accept $H_1$ (N1 higher) |

## TABLE XIX—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Mean Scores[d] |  | Decision |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 | N1 | N2 |  |
| Change Scores (Post Test to Terminal Test) |  |  |  |  |  |  |  |  |  |
| Grade 4 | 47 | 74 | 1672 | .362 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 64 | 54 | 1661 | .365 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 48 | 37 | 851 | .168 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 159 | 165 | 12785 | .301 | .. | .. | .. | .. | Accept $H_0$ |
| Terminal Tests |  |  |  |  |  |  |  |  |  |
| Grade 4 | 47 | 74 | 1555 | .998 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 64 | 54 | 1611 | .639 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 48 | 37 | 776 | 1.005 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 159 | 165 | 12200 | 1.103 | .. | .. | .. | .. | Accept $H_0$ |

[a] N1 = Experimental group.
[b] N2 = Control group.
[c] Median scores shown only if $\underline{z} > 1.960$ ($\alpha = .05$). Perfect score = 20.
[d] Mean scores shown only if median scores are tied. Perfect score = 20.
[e] Level of significance: less than .05, greater than .02.

## TABLE XX

## TESTS OF INTERVAL RECOGNITION: MALE VERSUS FEMALE PUPILS

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Pre Tests |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 120 | 119 | 5606 | 2.915[d] | 3 | 2 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Control Grades 4,5,6..... | 104 | 104 | 4875 | 1.260 | .. | .. | Accept $H_0$ |
| Change Scores (Pre Test to Post Test) |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 120 | 119 | 6874 | .504 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 104 | 104 | 5255 | .357 | .. | .. | Accept $H_0$ |
| Post Tests |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 120 | 119 | 6114 | 1.946 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 104 | 105 | 5002 | .950 | .. | .. | Accept $H_0$ |

TABLE XX—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| **Change Scores (Post Test to Terminal Test)** |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 76 | 83 | 2852 | .927 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 81 | 84 | 2702 | 2.313[e] | 0 | 1 | Reject $H_0$; accept $H_1$ (N2 higher) |
| **Terminal Tests** |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 76 | 83 | 2931 | .779 | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 81 | 84 | 2995 | 1.347 | .. | .. | Accept $H_0$ |

[a] Male pupils.

[b] Female pupils.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 20.

[d] Level of significance: less than .01, greater than .001.

[e] Level of significance: less than .05, greater than .02.

## TABLE XXI

## TESTS OF DISCRIMINATION OF PITCH ERRORS AND THE ABILITY TO CORRECT THEM: EXPERIMENTAL VERSUS CONTROL GROUPS

| Group | N1[a] | N2[b] | U | z Score | Median Ranks[c] | | Mean Ranks[d] | | Decision |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | N1 | N2 | N1 | N2 | |
| Pre Tests | | | | | | | | | |
| Grade 4 | 83 | 84 | 2998 | 1.618 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 82 | 59 | 2076 | 1.482 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 87 | 68 | 2650 | 1.137 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 252 | 211 | 25817 | .553 | .. | .. | .. | .. | Accept $H_0$ |
| Change Ranks (Pre Test to Post Test) | | | | | | | | | |
| Grade 4 | 83 | 84 | 3430 | .181 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 82 | 59 | 2026 | 1.653 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 87 | 68 | 2129 | 3.007[e] | 1 | 0 | .. | .. | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 252 | 211 | 22741 | 2.698[e] | 1 | 0 | .. | .. | Reject $H_0$; accept $H_1$ (N1 higher) |
| Post Tests | | | | | | | | | |
| Grade 4 | 83 | 84 | 3126 | 1.171 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 82 | 59 | 2258 | .682 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 87 | 68 | 2391 | 2.073[f] | 3 | 2 | .. | .. | Reject $H_0$; accept $H_1$ (N1 higher) |
| Grades 4,5,6 | 252 | 211 | 23287 | 2.332[g] | 2 | 2 | 3.80 | 2.91 | Reject $H_0$; accept $H_1$ (N1 higher) |

TABLE XXI—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Ranks[c] |  | Mean Ranks[d] |  | Decision |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 | N1 | N2 |  |
| Change Ranks (Post Test to Terminal Test) |  |  |  |  |  |  |  |  |  |
| Grade 4 | 46 | 77 | 1677 | .496 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 65 | 52 | 1599 | .502 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 47 | 38 | 779 | 1.015 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 158 | 167 | 12735 | .544 | .. | .. | .. | .. | Accept $H_0$ |
| Terminal Tests |  |  |  |  |  |  |  |  |  |
| Grade 4 | 46 | 77 | 1517 | 1.353 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 5 | 65 | 52 | 1671 | .106 | .. | .. | .. | .. | Accept $H_0$ |
| Grade 6 | 47 | 38 | 768 | 1.129 | .. | .. | .. | .. | Accept $H_0$ |
| Grades 4,5,6 | 158 | 167 | 11626 | 1.881 | .. | .. | .. | .. | Accept $H_0$ |

[a] N1 = Experimental group.

[b] N2 = Control group.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Highest rank = 26.

[d] Mean scores shown only if median scores are tied. Highest rank = 26.

[e] Level of significance: less than .01, greater than .001.

[f] Level of significance: less than .05, greater than .02.

[g] Level of significance: less than .02, greater than .01.

## TABLE XXII

TESTS OF DISCRIMINATION OF PITCH ERRORS AND THE ABILITY TO CORRECT THEM: MALE VERSUS FEMALE PUPILS

| Group | N1[a] | N2[b] | U | z Score | Median Ranks[c] |  | Mean Ranks[d] |  | Decision |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 | N1 | N2 |  |
| Pre Tests |  |  |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 129 | 123 | 6742 | 2.122[e] | 1 | 1 | 2.71 | 2.00 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Control Grades 4,5,6..... | 107 | 104 | 5550 | .033 | .. | .. | .. | .. | Accept $H_0$ |
| Change Ranks (Pre Test to Post Test) |  |  |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 129 | 123 | 7641 | .509 | .. | .. | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 107 | 104 | 5467 | .221 | .. | .. | .. | .. | Accept $H_0$ |
| Post Tests |  |  |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 129 | 123 | 6691 | 2.174[e] | 3 | 2 | .. | .. | Reject $H_0$; accept $H_1$ (N1 higher) |
| Control Grades 4,5,6..... | 107 | 104 | 5498 | .151 | .. | .. | .. | .. | Accept $H_0$ |

TABLE XXII—Continued.

| Group | N1[a] | N2[b] | U | z Score | Median Ranks[c] |  | Mean Ranks[d] |  | Decision |
|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 | N1 | N2 |  |
| Change Ranks (Post Test to Terminal Test) |  |  |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 78 | 80 | 2885 | .821 | .. | .. | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 83 | 84 | 3359 | .411 | .. | .. | .. | .. | Accept $H_0$ |
| Terminal Tests |  |  |  |  |  |  |  |  |  |
| Experimental Grades 4,5,6..... | 78 | 80 | 2957 | .574 | .. | .. | .. | .. | Accept $H_0$ |
| Control Grades 4,5,6..... | 83 | 84 | 3484 | .007 | .. | .. | .. | .. | Accept $H_0$ |

[a] N1 = Male pupils.

[b] N2 = Female pupils.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Highest rank = 26.

[d] Mean scores shown only if median scores are tied. Highest rank = 26.

[e] Level of significance: less than .05, greater than .02.

## TABLE XXIII

### TESTS OF STAFF KNOWLEDGE GIVEN TO FIFTH GRADE PUPILS DURING THE FIRST SEMESTER OF THE EXPERIMENT: CONTROL VERSUS CONTROL$^1$ GROUPS

| Measure | N1[a] | N2[b] | U | z Score | Decision |
|---|---|---|---|---|---|
| Pre Tests..... | 8 | 51 | 179.5 | .547 | Accept $H_0$ |
| Change Scores (Pre Test to Post Test).. | 8 | 51 | 192.0 | .267 | Accept $H_0$ |
| Post Tests.... | 8 | 51 | 177.0 | .602 | Accept $H_0$ |

[a] N1 = Control group.
[b] N2 = Control$^1$ group.

## TABLE XXIV

### TESTS OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION GIVEN TO FIFTH GRADE PUPILS DURING THE FIRST SEMESTER OF THE EXPERIMENT: CONTROL VERSUS CONTROL$^1$ GROUPS

| Measure | N1[a] | N2[b] | U | z Score | Decision |
|---|---|---|---|---|---|
| Pre Tests..... | 6 | 54 | 154 | .202 | Accept $H_0$ |
| Change Scores (Pre Test to Post Test).. | 6 | 54 | 119 | 1.101 | Accept $H_0$ |
| Post Tests.... | 6 | 54 | 141 | .525 | Accept $H_0$ |

[a] N1 = Control group.
[b] N2 = Control$^1$ group.

TABLE XXV

TESTS IN ALL FIVE AREAS GIVEN TO SIXTH GRADE PUPILS DURING THE SECOND SEMESTER OF THE EXPERIMENT: CONTROL VERSUS CONTROL$^2$ GROUPS

| Measure | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Test of Staff Knowledge |  |  |  |  |  |  |  |
| Change Scores (Post Test to Terminal Test)...... | 13 | 25 | 159 | .108 | .. | .. | Accept $H_0$ |
| Terminal Tests...... | 13 | 25 | 149 | .418 | .. | .. | Accept $H_0$ |
| Test of Knowledge of Fundamental Concepts of Tonal Organization[f] |  |  |  |  |  |  |  |
| Change Scores (Post Test to Terminal Test)...... | 15 | 24 | 110 | 2.057[d] | 1 | 0 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Terminal Tests...... | 15 | 24 | 97 | 2.441[e] | 5 | 3 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Test of Rhythmic Discrimination |  |  |  |  |  |  |  |
| Change Scores (Post Test to Terminal Test)...... | 15 | 24 | 126 | 1.580 | .. | .. | Accept $H_0$ |
| Terminal Tests...... | 15 | 24 | 130 | 1.467 | .. | .. | Accept $H_0$ |

TABLE XXV—Continued.

| Measure | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Test of Interval Recognition |  |  |  |  |  |  |  |
| Change Scores (Post Test to Terminal Test)...... | 15 | 22 | 135 | .943 | .. | .. | Accept $H_0$ |
| Terminal Tests...... | 15 | 22 | 160 | .157 | .. | .. | Accept $H_0$ |
| Test of Discrimination of Pitch Errors and the Ability to Correct Them |  |  |  |  |  |  |  |
| Change Scores (Post Test to Terminal Test)...... | 14 | 24 | 139 | .890 | .. | .. | Accept $H_0$ |
| Terminal Tests...... | 14 | 24 | 143 | .781 | .. | .. | Accept $H_0$ |

[a] N1 = Control Group.

[b] N2 = Control$^2$ Group.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$).

[d] Level of significance: less than .05, greater than .02.

[e] Level of significance: less than .02, greater than .01.

[f] Perfect score = 20.

## TABLE XXVI

### TESTS OF STAFF KNOWLEDGE GIVEN FOURTH GRADE PUPILS DURING THE SECOND SEMESTER OF THE EXPERIMENT: EXPERIMENTAL GROUPS COMPLETING WRITTEN CLASSWORK VERSUS EXPERIMENTAL GROUPS COMPLETING NONE OR SOME OF THE WRITTEN CLASSWORK

| Measure | N1[a] | N2[b] | $U$ | $z$ Score | Median Score[f] | | Decision[c] |
|---|---|---|---|---|---|---|---|
| | | | | | N1 | N2 | |
| Change Scores (Post Test to Terminal Test)...... | 23 | 12 | 76 | 2.159[d] | 10 | 2 | Reject $H_0$; accept $H_1$ (N1 higher) |
| Terminal Tests...... | 23 | 12 | 36 | 3.553[e] | 19 | 8 | Reject $H_0$; accept $H_1$ (N1 higher) |

[a] N1 = Experimental groups completing written classwork.

[b] N2 = Experimental groups completing none or some of the written classwork.

[c] Decision based on $z > 1.960$ ($\alpha = .05$).

[d] Level of significance: less than .05, greater than .02.

[e] Level of significance: less than .001, greater than .0001.

[f] Perfect score = 40.

## TABLE XXVII

### TESTS OF RHYTHMIC DISCRIMINATION GIVEN FOURTH AND SIXTH GRADE PUPILS DURING THE SECOND SEMESTER OF THE EXPERIMENT: TRAINED VERSUS UNTRAINED EXPERIMENTAL GROUPS

| Measure | N1[a] | N2[b] | U | z Score | Median Scores[c] |  | Decision |
|---|---|---|---|---|---|---|---|
|  |  |  |  |  | N1 | N2 |  |
| Fourth Grade |  |  |  |  |  |  |  |
| Change Scores (Post Test to Terminal Test)...... | 17 | 30 | 251 | .090 | .. | .. | Accept $H_0$ |
| Terminal Tests...... | 17 | 30 | 206 | 1.109 | .. | .. | Accept $H_0$ |
| Sixth Grade |  |  |  |  |  |  |  |
| Change Scores (Post Test to Terminal Test)...... | 34 | 23 | 345 | .758 | .. | .. | Accept $H_0$ |
| Terminal Tests...... | 34 | 23 | 230 | 2.649[d] | 4 | 3 | Reject $H_0$; accept $H_1$ (N1 higher) |

[a] N1 = Trained experimental groups.

[b] N2 = Untrained experimental groups.

[c] Median scores shown only if $z > 1.960$ ($\alpha = .05$). Perfect score = 10.

[d] Level of significance: less than .01, greater than .001.

## TABLE XXVIII

### TESTS OF INTERVAL RECOGNITION GIVEN SIXTH GRADE PUPILS DURING THE SECOND SEMESTER OF THE EXPERIMENT: TRAINED VERSUS UNTRAINED EXPERIMENTAL GROUPS

| Measure | N1[a] | N2[b] | $U$ | $z$ Score | Decision[c] |
|---|---|---|---|---|---|
| Change Scores (Post Test to Terminal Test)...... | 32 | 16 | 221 | .772 | Accept $H_0$ |
| Terminal Tests...... | 32 | 16 | 230 | .576 | Accept $H_0$ |

[a] N1 = Trained experimental groups.
[b] N2 = Untrained experimental groups.
[c] Decision based on $z > 1.960$ ($\alpha = .05$).

## APPENDIX K. RETENTION TEST DETAILS

The group of fourth grade pupils being tested (Control$^3$) are subjected to the experimental procedure during the first semester and to the control procedure during the second semester. During the first semester the pupils are taught by the author and receive Pre and Post Tests; during the second semester the pupils are taught by a classroom teacher qualified to teach music. At the end of the second semester the pupils receive the Terminal Test. The Change Scores (Post Test to Terminal Test) of the pupils are analyzed in Area 1 (Staff Knowledge)(see Table XXIX, page K-2) and Area 2 (Knowledge of Fundamental Concepts of Tonal Organization)(see Table XXX, page K-3); there was no specific training given in Areas 3, 4, and 5 during the first semester that would require an analysis of retention.

1. Null Hypothesis. $H_0$: the scores of the Post Tests and the scores of the Terminal Tests of Control$^3$ pupils do not differ in (a) Area 1, (b) Area 2. In terms of the Wilcoxon test, the sum of the positive ranks = the sum of the negative ranks. $H_1$: the scores of the Post Tests and the scores of the Terminal Tests of Control$^3$ pupils differ in (a) Area 1, (b) Area 2; i.e., the sum of the positive ranks $\neq$ the sum of the negative ranks.

2. Statistical Test. The Wilcoxon matched-pairs signed-ranks test is chosen because the study employs two related samples and it yields difference scores which may be ranked in order of absolute magnitude.

3. Significance Level. Let $\alpha = .05$. N = the number of pairs minus any pair whose d is zero. In (a), N = 22 - 2 = 20. In (b), N = 33 - 3 = 30.

4. Sampling Distribution. Under $H_0$, the values of z as computed from a formula for z (15) are normally distributed with zero mean and unit variance; a table of probabilities associated with values as extreme as observed values of z in the normal distribution gives the probability associated with the occurence under $H_0$ of values as extreme as an obtained z.

5. Rejection Region. Since the direction of difference is not predicted, a two-tailed region of rejection is appropriate. The region of rejection consists of all z's which are so extreme that the probability associated with their occurence under $H_0$ is equal to or less than $\alpha = .05$ for a two-tailed test.

6. Decision. If the probability (obtained from the table mentioned in "4." above) associated with the z found in the formula above (see "4." above) is greater than $\alpha = .05$,

## TABLE XXIX

## TEST OF STAFF KNOWLEDGE GIVEN FOURTH GRADE PUPILS: POST AND TERMINAL TEST SCORES OF CONTROL[3] GROUP COMPARED

| Pair | Post Test score | Terminal Test score | d | % of retention | Rank of d | Rank with less frequent sign |
|---|---|---|---|---|---|---|
| 1 | 08 | 03 | -05 | 37.5 | -11.5 | -11.5 |
| 2 | 04 | 04 | 00 | 100.0 | ..... | ..... |
| 3 | 11 | 08 | -03 | 72.7 | -05.0 | -05.0 |
| 4 | 09 | 01 | -08 | 11.1 | -15.5 | -15.5 |
| 5 | 09 | 06 | -03 | 66.7 | -05.0 | -05.0 |
| 6 | 19 | 21 | 02 | 110.5 | 01.0 | ..... |
| 7 | 07 | 03 | -04 | 42.9 | -09.5 | -09.5 |
| 8 | 18 | 31 | 13 | 172.2 | 17.0 | ..... |
| 9 | 06 | 06 | 00 | 100.0 | ..... | ..... |
| 10 | 04 | 08 | 04 | 200.0 | 09.5 | ..... |
| 11 | 11 | 14 | 03 | 127.3 | 05.0 | ..... |
| 12 | 32 | 39 | 07 | 121.9 | 13.5 | ..... |
| 13 | 30 | 15 | -15 | 50.0 | -18.0 | -18.0 |
| 14 | 09 | 14 | 05 | 155.6 | 11.5 | ..... |
| 15 | 30 | 38 | 08 | 126.7 | 15.5 | ..... |
| 16 | 04 | 21 | 17 | 525.0 | 19.0 | ..... |
| 17 | 21 | 18 | -03 | 85.7 | -05.0 | -05.0 |
| 18 | 16 | 13 | -03 | 81.3 | -05.0 | -05.0 |
| 19 | 27 | 07 | -20 | 25.9 | -20.0 | -20.0 |
| 20 | 06 | 13 | 07 | 216.7 | 13.5 | ..... |
| 21 | 05 | 08 | 03 | 160.0 | 05.0 | ..... |
| 22 | 23 | 26 | 03 | 113.0 | 05.0 | ..... |
|  |  |  |  |  |  | T = 94.5 |

## TABLE XXX

## TEST OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION GIVEN FOURTH GRADE PUPILS: POST AND TERMINAL SCORES OF CONTROL[3] GROUP COMPARED

| Pair | Post Test score | Terminal Test score | d | % of retention | Rank of d | Rank with less frequent sign |
|---|---|---|---|---|---|---|
| 1 | 01 | 05 | 04 | 500.0 | 24 | ... |
| 2 | 05 | 05 | 00 | 100.0 | ... | ... |
| 3 | 09 | 12 | 03 | 133.3 | 16 | ... |
| 4 | 09 | 11 | 02 | 122.2 | 08 | ... |
| 5 | 05 | 08 | 03 | 160.0 | 16 | ... |
| 6 | 06 | 09 | 03 | 150.0 | 16 | ... |
| 7 | 05 | 06 | 01 | 120.0 | 03 | ... |
| 8 | 09 | 13 | 04 | 144.0 | 24 | ... |
| 9 | 05 | 08 | 03 | 160.0 | 16 | ... |
| 10 | 06 | 12 | 06 | 200.0 | 28 | ... |
| 11 | 09 | 08 | -01 | 88.8 | -03 | -03 |
| 12 | 06 | 13 | 07 | 216.6 | 29 | ... |
| 13 | 18 | 15 | -03 | 83.3 | -16 | -16 |
| 14 | 07 | 07 | 00 | 100.0 | ... | ... |
| 15 | 06 | 06 | 00 | 100.0 | ... | ... |
| 16 | 06 | 07 | 01 | 116.6 | 03 | ... |
| 17 | 08 | 05 | -03 | 62.5 | -16 | -16 |
| 18 | 06 | 03 | -03 | 50.5 | -16 | -16 |
| 19 | 11 | 12 | 01 | 109.0 | 03 | ... |
| 20 | 02 | 05 | 03 | 250.0 | 16 | ... |
| 21 | 12 | 10 | -02 | 83.3 | -08 | -08 |
| 22 | 12 | 16 | 04 | 133.3 | 24 | ... |
| 23 | 15 | 05 | -10 | 133.3 | 30 | ... |
| 24 | 15 | 10 | -05 | 66.6 | -27 | -27 |
| 25 | 06 | 08 | 02 | 133.3 | 08 | ... |
| 26 | 08 | 05 | -03 | 62.5 | -16 | -16 |
| 27 | 06 | 04 | -02 | 66.6 | -08 | -08 |
| 28 | 03 | 06 | 03 | 200.0 | 16 | ... |
| 29 | 07 | 05 | -02 | 71.4 | -08 | -08 |
| 30 | 17 | 13 | -04 | 76.5 | -24 | -24 |
| 31 | 07 | 03 | -04 | 42.8 | -24 | -24 |
| 32 | 04 | 05 | 01 | 25.0 | 03 | ... |
| 33 | 07 | 04 | -03 | 57.1 | -16 | -16 |
| | | | | | | T = 182 |

accept $H_0$. If the probability associated with the z found in the formula above is equal to or less than $\alpha = .05$, reject $H_0$ and accept $H_1$.

(a) Area 1. z = -.39, which has a one-tailed probability of .3483 and a two-tailed probability of .6966 at the $\alpha = .05$ level. Since the two-tailed probability of .6966 is greater than $\alpha = .05$, accept $H_0$; i.e., that there is no significant difference in the scores of the Post Tests and the scores of the Terminal Tests of $\text{Control}^3$ pupils in Area 1 (Staff Knowledge) at the .05 level of significance.

(b) Area 2. z = -.97, which has a one-tailed probability of .1660 and a two-tailed probability of .3320 at the $\alpha = .05$ level. Since the two-tailed probability of .3320 is greater than $\alpha = .05$, accept $H_0$; i.e., that there is no significant difference in the scores of the Post Tests and the scores of the Terminal Tests of $\text{Control}^3$ pupils in Area 2 (Knowledge of Fundamental Concepts of Tonal Organization) at the .05 level of significance.

For a summary of medians of tests relating to retention, see Table XXXI on the following page.

# TABLE XXXI

## SUMMARY OF MEDIANS OF TESTS RELATING TO RETENTION (ADMINISTERED TO FOURTH GRADE PUPILS OF THE CONTROL[3] GROUP)

| Measure | Median Scores | | | Per Cent of Retention |
|---|---|---|---|---|
| | Post Test | Change Scores (Terminal Test to Post Test) | Terminal Test | |
| Test of Staff Knowledge (Perfect Score=40)... | 9 | +1 | 11 | 105.25 |
| Test of Knowledge of Fundamental Concepts of Tonal Organization (Perfect Score=40)... | 7 | +1 | 7 | 109.00 |

# APPENDIX L. DATA IN SUPPORT OF NON-EQUIVALENCE OF CERTAIN GRADES IN EXPERIMENTAL AND CONTROL GROUP PRE TESTS, AREA 2, KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION

## TABLE XXXII

## TEST OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION MEDIAN SCORES: EXPERIMENTAL AND CONTROL GROUPS COMPARED IN GRADE 6 AND GRADES 4, 5, AND 6 COMBINED

| Measure | Median Scores[a] (Perfect Score = 20) | |
|---|---|---|
| | Experimental | Control |
| | Grade 6 | |
| Pre Test........... | 4 | 2 |
| Change Scores (Pre Test to Post Test)....... | 5 | 0 |
| Post Test.......... | 7 | 3 |
| Change Scores (Post Test to Terminal Test)... | 4 | 0 |
| Terminal Test...... | 12 | 4 |
| | Grades 4, 5, and 6 Combined | |
| Pre Test........... | 3 | 2 |
| Change Scores (Pre Test to Post Test)....... | 5 | 0 |
| Post Test.......... | 6 | 2 |
| Change Scores (Post Test to Terminal Test)... | 3 | 0 |
| Terminal Test...... | 12 | 3 |

Note: [a]Median Scores from Table XV, pages J-5 and J-6.

## TABLE XXXIII

## TEST OF KNOWLEDGE OF FUNDAMENTAL CONCEPTS OF TONAL ORGANIZATION: A COMPARISON OF MEDIAN SCORE POINTS GAINED BY EXPERIMENTAL AND CONTROL GROUPS IN GRADE 6 AND GRADES 4, 5, AND 6 COMBINED

| Measures | Median Score Points Gained[a] (Perfect Score = 20) | |
|---|---|---|
| | Experimental | Control |
| | Grade 6 | |
| Pre Test to Post Test........ | 3 | 1 |
| Post Test to Terminal Test.... | 5 | 1 |
| Pre Test to Terminal Test.... | 8 | 2 |
| | Grades 4, 5, and 6 Combined | |
| Pre Test to Post Test....... | 3 | 0 |
| Post Test to Terminal Test.... | 6 | 1 |
| Pre Test to Terminal Test.... | 9 | 1 |

Note:

[a] Median score points gained are computed from Table XXXII on page L-1.